SOCIETA' ITALIANA DI MALACOLOGIA

SEDE SOCIALE: c/o Acquario Civico, Viale Gadio, 2 - 20121 Milano
http://www.aicon.com/sim

LINEA EDITORIALE

Il *Bollettino Malacologico* è pubblicato dalla Società Italiana di Malacologia. Il suo scopo è la comprensione e la divulgazione di tutti gli aspetti della malacologia attraverso la pubblicazione di articoli originali, note brevi e monografie riguardanti la tassonomia, l'ecologia e la biodiversità di molluschi sia viventi che fossili.
L'area mediterranea e quelle collegate ad essa da un punto di vista paleontologico od ecologico riceveranno particolare attenzione ai fini della pubblicazione dei contributi.
Sono accettati lavori scritti in inglese, italiano, francese e spagnolo. Ogni anno vengono pubblicati tre fascicoli del *Bollettino Malacologico*. Monografie, atti o contributi più lunghi di venti pagine (nella loro versione definitiva) verranno pubblicati come supplemento; la data approssimativa di pubblicazione deve essere concordata in anticipo con gli Editori.

CITATO NEI: *Zoological Records*.

INVIO DEI MANOSCRITTI E PROCESSO DI REVISIONE

I manoscritti vanno inviati in triplice copia (un originale e due copie di buona qualità) al Direttore Scientifico:

Stefano Schiaparelli
Dip.Te.Ris. Dipartimento per lo Studio del Territorio e delle sue Risorse
Università di Genova
C.so Europa 26, Genova, I-16132, Italia
steschia@dipteris.unige.it

Ogni manoscritto deve essere accompagnato da una lettera di accompagnamento con l'esplicita dichiarazione che i dati trattati non sono stati pubblicati precedentemente, che non sono presi in considerazione per la pubblicazione presso altra rivista e che la loro pubblicazione è stata approvata da tutti i coautori. Un abstract in formato elettronico può essere inviato (anche via posta elettronica) insieme al manoscritto cartaceo, al fine di poter velocizzare le fasi iniziali del processo di revisione.
Una lista dei potenziali referees (preferibilmente stranieri) con relativo indirizzo (completo di indirizzo di posta elettronica), può essere fornita insieme al manoscritto; la scelta di questi referees rimane tuttavia giudizio insindacabile degli editori.
La ricezione del manoscritto verrà immediatamente comunicata all'Autore ed il manoscritto verrà inviato ad almeno due referees per la revisione. I referees assistono i Co-editori e il Direttore Scientifico nel processo di valutazione dei manoscritti al fine di ottenere commenti e suggerimenti in grado di migliorare il testo prima della sua eventuale accettazione e pubblicazione sul *Bollettino Malacologico*. I commenti dei revisori verranno comunicati all'Autore non appena il manoscritto sia stato corretto da due referees ed una decisione editoriale raggiunta. La data di ricezione e quella di accettazione del manoscritto verranno riportate sulla prima pagina della versione finale del contributo. Tutto il materiale che accompagna un manoscritto accettato (figure e fotografie incluse) rimane proprietà della S.I.M. e pertanto non verrà restituito all'Autore.

EDITORIAL POLICY

The Bollettino Malacologico is published by the Italian Society of Malacology. It is devoted to the understanding of all aspects of Malacology and publishes original articles, short notes and monographs regarding taxonomy, ecology and biodiversity of living and fossil molluscs. The Mediterranean area and those paleontologically-ecologically connected to it will receive special attention.
Manuscripts in English, Italian, French and Spanish are accepted. Three issues of the Bollettino Malacologico appear each year. Monographs, proceedings or papers longer than 20 pages (in their final version) will be published as a supplement, and their time schedule should be discussed in advance with the Editors.

INDEXED IN: Zoological Records.

MANUSCRIPT SUBMISSION AND THE REVIEW PROCESS

Manuscripts should be submitted in triplicate (the original and two copies of good quality) to the Editor-in-Chief:

Stefano Schiaparelli
Dip.Te.Ris. Dipartimento per lo Studio del Territorio e delle sue Risorse
Università di Genova
C.so Europa 26, Genova, I-16132, Italia
steschia@dipteris.unige.it

A cover letter should accompany each manuscript and include a statement that the data therein described have not been published before, that they are not under consideration for publication anywhere else and that the publication has been approved by all co-authors. An electronic abstract can be sent with the manuscript (or by e-mail) in order to facilitate the initial stages of the review process.
A list of potential reviewers (preferably outside Italy) with relative addresses and e-mail, may be included, althought their choice is under the judgement of the editors.
The manuscript receipt will be immediately acknowledged to the corresponding author and the manuscript will be normally reviewed, in a timely manner, by at least two referees. The referees assist the Co-Editors and the Editor-in-Chief in their effort to obtain comments and suggestion for acceptance of manuscripts. The reviewers comments will be notified as soon as two referee have checked the manuscript and an editorial decision has been reached.
The dates of receipt and acceptance will be noted on the title page of the published contribution. All the material that accompany an accepted manuscript (including figures and photograps) remains property of the S.I.M. and will not sent back to the authors.

Bollettino Malacologico, Roma, **39** (5-8): 49-78, [2003] 2004- Società Italiana di Malacologia

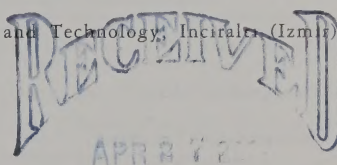
Marine molluscs from Cyprus: new data and checklist

Bilal Öztürk, Giovanni Buzzurro & H. Avni Benli

KEY WORDS: Mollusca, Recent, Checklist, Cyprus, Mediterranean Sea.

ABSTRACT This study has been carried out along the North Cypriot coasts on May 10th-19th 1997 and July 12th-21st 1998. As a result of the sampling in the shore region and in deep-water, depths ranging from 0 to 600 m, 304 species, for a total number of 4786 individuals, included in the classes of Polyplacophora, Gastropoda, Bivalvia and Scaphopoda have been identified. Among the 304 taxa examined, 18 species from Cyprus Island are here reported for the first time. In particular, 16 Gastropoda: *Nodilittorina (Echinolittorina) punctata* (Gmelin, 1791), *Rissoa splendida* Eichwald, 1830, *Alvania fractospira* Oberling, 1970, *Alvania testae* (Aradas & Maggiore, 1844), *Hydrobia acuta* (Draparnaud, 1805), *Protatlanta souleyeti* (Smith E. A., 1888), *Cerithiopsis scalaris* Locard, 1892, ex Monterosato ms., *Nassarius circumcictus* (Adams A., 1852), *Granulina boucheti* Gofas, 1992, *Gymnobela subaraneosa* (Dautzenberg & Fischer H., 1896), *Teretia teres* (Reeve, 1844), *Chrysallida juliae* (de Folin, 1872), *Folinella ghisottii* Aartsen, 1984, *Tragula fenestrata* (Jeffreys, 1848), *Eulimella bogii* Aartsen, 1994, *Turbonilla acutissima* Monterosato, 1884, and 2 Bivalvia: *Limaria loscombi* (Sowerby G. B. I, 1823), *Kelliella abyssicola* (Forbes, 1844). Furthermore, six species are reported for the Eastern basin for the first time. All the species reported for the first time from Cyprus in this paper are figured and discussed. A total amount of 696 species is here reported in a newly formed checklist of Molluscs of Cyprus, considering all the previous works concerned about the malacological fauna occurring in the area under investigation and the additional species we have identified. Furthermore, the list, which is taking into account the many nomenclatural changes recently introduced in the class Mollusca, also deals with alien species.

RIASSUNTO Questo studio è stato condotto lungo le coste della parte Nord dell'isola di Cipro tra il 10 e il 19 Maggio del 1997 e il 12 e il 21 Luglio del 1998. Sono stati raccolti campioni fino alla profondità massima di 600 m, individuando 4786 esemplari distribuiti tra 304 specie appartenenti alle classi Poliplacophora, Gastropoda, Bivalvia e Scaphopoda. Di queste 304 specie 18 risultano inedite per Cipro, 16 Gastropoda: *Nodilittorina (Echinolittorina) punctata* (Gmelin, 1791), *Rissoa splendida* Eichwald, 1830, *Alvania fractospira* Oberling, 1970, *Alvania testae* (Aradas & Maggiore, 1844), *Hydrobia acuta* (Draparnaud, 1805), *Protatlanta souleyeti* (Smith E. A., 1888), *Cerithiopsis scalaris* Locard, 1892, ex Monterosato ms., *Nassarius circumcictus* (Adams A., 1852), *Granulina boucheti* Gofas, 1992, *Gymnobela subaraneosa* (Dautzenberg & Fischer H., 1896), *Teretia teres* (Reeve, 1844), *Chrysallida juliae* (de Folin, 1872), *Folinella ghisottii* Aartsen, 1984, *Tragula fenestrata* (Jeffreys, 1848), *Eulimella bogii* Aartsen, 1994, *Turbonilla acutissima* Monterosato, 1884 e 2 Bivalvia: *Limaria loscombi* (Sowerby G. B. I, 1823), *Kelliella abyssicola* (Forbes, 1844). Tra queste, 6 specie sono inedite per il bacino orientale del Mar Mediterraneo. Di tutte le specie trattate si dà anche una rappresentazione iconografica. Viene presentata inoltre una nuova lista aggiornata comprendente tutte le specie precedentemente segnalate in Letteratura e quelle ulteriormente identificate da noi, per un totale di 696 taxa. Questa lista, corredata da relative note integrative ed in accordo con gli ultimi aggiornamenti tassonomici, evidenzia anche le specie di provenienza indopacifica.

B. ÖZTÜRK, Ege University, Faculty of Fisheries, Department of Hydrobiology, 35100 Bornova (Izmir), Turkey, E-mail: Ozturk@sufak.ege.edu.tr
G. BUZZURRO, Via Locatelli 44, Biassono (Mi), Italy, E-mail: giobuz@libero.it
H. A. BENLI, Dokuz Eylül Üniversity, Institute of Marine Science and Technology, Inciralti (Izmir), Turkey, E-mail: benli@neptune.imst.deu.edu.tr

INTRODUCTION

The island of Cyprus has special ecological characteristics due to its narrow sublittoral and littoral but wide bathyal zones. This island, with a coastline of 750 km in length, is an important biogeographical spot in the Levantine basin where Red Sea originated Lessepsian migrants establish. There are many studies so far carried out by different scientists on the biological diversity Cyprus' bottoms. The first report on the Mollusca from the coasts of this island was by MONTEROSATO (1899). Thereafter, many works were carried out especially in the second half of century. Among the others, we cite TSURNAMAL (1969), DEMETROPOULOS (1969, 1971), BARASH & LEWINSOHN (1971), DEMETROPOULOS & HADJICHRISTOPHOROU (1976), STAVRINOS (1984), TORNARITIS (1987), BARASH & DANIN (1989), BOGI *et al.* (1989), FISCHER (1993a, b; 1994), CECALUPO & QUADRI (1994, 1995, 1996) and HADJICHRISTOPHOROU *et al.* (1997). As a result of these studies, 585 Mollusca species have been reported from Cyprus (CECALUPO & QUADRI, 1996). More recently, BUZZURRO & GREPPI (1997) and SALMAN *et al.* (1998) have reported 42 and 10 additional species, respectively.

Several checklists of the molluscan fauna of Cyprus have been published in the past by different Authors (DEMETROPOULOS, 1971; BOGI *et al.*, 1989; FISCHER, 1994 and CECALUPO & QUADRI, 1996). However, some of these early reports suffered the complicated taxonomy of some groups, and several species were listed as separate taxa in spite of being synonyms according to the latest taxonomy. In this paper we present an up to date checklist of Mollusca species occurring in the Island of Cyprus. With this report, the total number of Mollusca occurring along the Cyprus coasts has been enriched with 16 Gastropoda and 2 Bivalvia species.

MATERIAL AND METHODS

Specimens and shells identified in this study were collected during the expeditions along Northern Cyprus coasts on the dates of May 10th-19th, 1997 and July 12nd-21st, 1998 by R/V " K. Piri Reis". Samples were taken from a depth ranging from 0 to 10 m along the shore region and from 20 to 600 m offshore (Fig.1). Sampling have been randomly selected in the coastal regions having both sandy and rocky habitat and in the substrates consisting of algae (*Padina pavonica* (L) Thivy, 1960, *Cystoseira crinita* (Desf.) Bory, 1846, *Cystoseira* sp., *Sargassum vulgare* C. Agardh, 1821, *Udotea petiolata* (Turra) Boerg, 1915, *Caulerpa prolifera* (Forskkal) Lamaroux, 1809, *Caulerpa racemosa* (Forskkal) J. Agardh), phanerogam (*Posidonia oceanica* (L.) Delile, 1813) and sponge (*Sarcotragus* sp.) (Table 1). Samples were collected directly by hand. A total of 70 samplings were carried out at 12 stations. Furthermore, in the open sea, trawl-

ing and dredging have been utilized. Samples were sieved with 0.5 mm mesh size.
Systematics of the identified species are according to Sabelli *et al.* (1990-1992). Moreover, species names reported in the past by several Authors have been reconsidered according to Sabelli *et al.* (1990-1992) during the preparation of this new checklist. Thus, the list was cleaned up of synonym species. The many changes occurred in the nomenclature of Mollusca after 1990 have been also considered. Furthermore, systematic information about some species was adopted by visiting the web-site Check List of European Marine Mollusca (CLEMAM: home page, http://www.mnhn.fr/base/malaco/html).
The materials collected were deposited in the Depatment of Hydrobiology, Ege University (Izmir, Turkey).

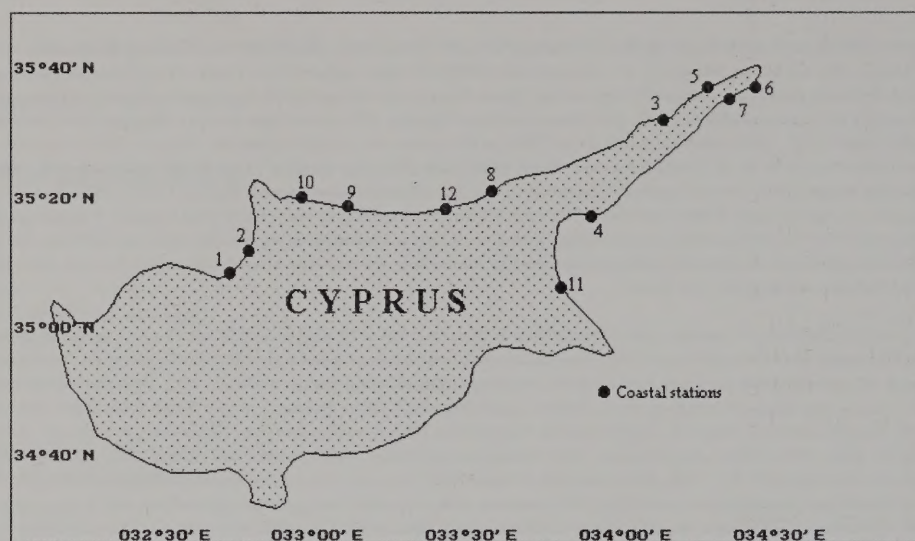



Fig. 1. Map of studied area with locations of shallow water stations.
Fig. 1. Cartina dell'area studiata con l'indicazione delle stazioni di acque poco profonde.

Table 1. Coordinates, localities, depths, dates and biotop characterizations of the samples.

BOTTOM-TRAWL

St.	Date	Coordinates or Localities Start / Finish	Depth (m)	Biotopes
T1	10.5.97	35°21'7"N-33°07'5"E / 35°23'9"N-33°09'0"E	560-576	Mud
T2	10.5.97	35°22'7"N-33°02'6"E / 35°22'7"N-33°04'2"E	33-35	Hard substratum and *Sarcotragus* sp.
T3	11.5.97	35°20'58"N-33°23'4"E / 35°20'7"N-33°22'5"E	40-46	*Posidonia oceanica*
T4	12.5.97	35°20'7"N-33°28'6"E / 35°20'6"N-33°27'5"E	28-38	*Posidonia oceanica*
T5	12.5.97	35°22'9"N-33°41'0"E / 35°22'4"N-33°39'3"E	38-45	*Posidonia oceanica* and *Caulerpa prolifera*
T7	13.5.97	35°19'2"N-32°54'6"E / 35°17'7"N-32°54'4"E	28-45	*Posidonia oceanica*
T9	13.5.97	35°12'5"N-32°52'3"E / 35°11'2"N-32°51'8"E	75-85	Muddy sand with *Caulerpa racemosa*
T10	16.5.97	35°40'3"N-34°39'1"E / 35°39'7"N-34°37'8"E	275-337	Mud
T11	16.5.97	35°40'9"N-34°35'4"E / 35°40'6"N-34°35'3"E	27-45	*Posidonia oceanica*
T12	17.5.97	35°26'7"N-34°10'4"E / 35°25'0"N-34°08'4"E	32-95	*Posidonia oceanica*
T13	17.5.97	35°25'1"N-34°11'1"E / 35°26'3"N-34°11'7"E	37-69	*Posidonia oceanica*
T14	17.5.97	35°21'5"N-34°10'4"E / 35°21'9"N-34°08'9"E	187-155	Mud
T17	185.97	35°13'9"N-33°56'9"E / 35°15'2"N-33°57'0"E	100-145	Hard substratum
T18	18.5.97	35°13'6"N-33°56'0"E / 35°15'0"N-33°55'8"E	62-70	Muddy sand with *Caulerpa racemosa*
T19	18.5.97	35°12'0"N-33°55'6"E / 35°13'3"N-33°55'1"E	37-38	Muddy-sand with *Caulerpa racemosa* and *Udotea petiolata*
T20	19.5.97	35°11'1"N-33°56'7"E / 35°10'3"N-33°55'9"E	50-100	Mud and *Sarcotragus* sp.
T21	19.5.97	35°11'1"N-33°58'0"E / 35°10'0"N-33°57'0"E	66-150	Muddy sand with *Caulerpa racemosa* and *Udotea petiolata*
T22	14.7.98	35°19'1"N-32°49'0"E / 35°18'6"N-32°49'9"E	223-227	Mud
T23	17.7.98	35°47'7"N-34°43'8"E / 35°47'9"N-34°44'1"E	113-114	Mud
T24	19.7.98	35°06'4"N-34°00'5"E / 35°07'6"N-33°59'6"E	90-89	Mud
T25	19.7.98	35°09'4"N-33°59'1"E / 35°10'4"N-33°58'5"E	105-131	Mud with shell fragments
T26	19.7.98	35°11'8"N-33°56'3"E / 35°10'6"N-33°57'2"E	59-70	Mud

DREDJ

St.	Date	Coordinates or Localities Start / Finish	Depth (m)	Biotopes
D1	10.5.97	35°29'1"N-33°58'0"E	50	Hard substratum
D2	12.5.97	35°22'4"N-33°39'9"E	35	Sandy mud with shell fragments
D3	12.5.97	35°20'7"N-33°28'3"E	35	Sandy mud with shell fragments
D4	15.5.97	35°37'8"N-34°21'1"E	35	Sand with *Brachiostoma lanceolatum* and *Posidonia oceanica*
D7	16.5.97	35°35'7"N-34°27'4"E	70	Mud with *Ascidia* sp.
D8	16.5.97	35°34'8"N-34°25'9"E	35	*Posidonia oceanica*
D9	16.5.97	35°34'4"N-34°26'9"E	140	Mud
D10	16.5.97	35°34'8"N-34°28'3"E	210	Mud
D11	19.5.97	35°10'0"N-33°59'4"E	25	*Posidonia oceanica*
D13	19.5.97	35°08'7"N-33°57'6"E	92	Hard substratum with *Sargassum vulgare*
D14	12.7.98	35°30'0"N-33°09'9"E	600	Mud
D15	14.7.98	35°10'0"N-32°50'0"E	69	Sandy mud with shell fragments
D16	14.7.98	35°19'9"N-32°50'1"E	210	Mud
D17	16.7.98	35°43'8"N-34°37'3"E	250-300	Mud with shell fragments
D18	16.7.98	35°33'8"N-34°13'0"E	32	*Posidonia oceanica*
D19	17.7.98	35°24'8"N-34°10'1"E	50	Muddy sand with *Caulerpa racemosa*
D20	18.7.98	35°08'7"N-34°00'1"E	120	Mud
D21	19.7.98	35°09'0"N-33°57'0"E	20	*Posidonia oceanica*

DIVING

St.	Date	Coordinates or Localities Start / Finish	Depth (m)	Biotopes
C1	14.7.98	Guzelyurt Bay	0-10	*Cystoseira crinita*, *Posidonia oceanica*, rocks and sand
C2	14.7.98	Guzelyurt Bay	0-10	*Cystoseira crinita* and sand
C3	18.7.98	Karpas Cape	0-10	*Cystoseira crinita*, *Posidonia oceanica* and rocks
C4	18.7.98	Famagusta Bay	0-10	*Posidonia oceanica* and rocks
C5	19.7.98	Karpas Cape	0-10	*Cystoseira* sp., *Posidonia oceanica* and rocks
C6	19.7.98	Karpas Cape	0-10	*Padina pavonica*, *Posidonia oceanica* and rocks
C7	19.7.98	Karpas Cape	0-10	*Cystoseira* sp. and rocks
C8	21.7.98	Girne	0-10	*Cystoseira crinita*, *Posidonia oceanica* and rocks
C9	21.7.98	Malazgirt	0-10	*Padina pavonica*, *Cystoseira crinita*, *Posidonia oceanica* and rocks
C10	21.7.98	Kormakiti Cape	0-10	*Cystoseira crinita*, *Posidonia oceanica* and sand
C11	21.7.98	Famagusta Harbour	0-3	Rocks with *Cystoseira crinita*
C12	13.7.98	Girne Harbour	0-1	*Padina pavonica*

RESULTS

During the study carried out in the Northern Cypriot coasts, 4786 specimens were collected. As a result of evaluation of this sampling, 9 Polyplacophora, 183 Gastropoda, 110 Bivalvia and 2 Scaphopoda species were identified (Table 2).
Out of 304 species identified during this study, 18 species are here reported for the first time from Cyprus (Table 3).
According to the literature so far analyzed, 6 of these 18 species have never been reported before for the entire Levantine basin, i.e.: *Rissoa splendida* Eichwald, 1830, *Protatlanta souleyeti* (Smith E. A., 1888), *Cerithiopsis scalaris* Locard, 1892, ex Monterosato ms., *Granulina boucheti* Gofas, 1992, *Teretia teres* (Reeve, 1844) and *Turbonilla acutissima* (Monterosato, 1884).

Table 2: Taxonomical distribution of the species examined.

Classis	Ordo	Familia	Genus	Species
Polyplacophora	1	4	6	9
Gastropoda	12	59	109	183
Bivalvia	10	38	83	110
Scaphopoda	-	2	2	2
Total	23	103	200	304

Table 3: Molluscs species known from the Cyprus Island (examined material and literature).
L: literature (Lx : Authors from the literature); FR: first record for the area; N: notes (*indopacific origin); R: findings from our material; Z: figures.

SPECIES	L	N	R	Z
POLYPLACOPHORA				
Leptochitonidae				
Lepidopleurus cajetanus (Poli, 1791)	L3		+	
Lepidopleurus bedullii (Dell'Angelo & Palazzi, 1986)	L23	1		
Lepidopleurus cancellatus (Sowerby G. B. II, 1840)	L3			
Ischnochitonidae				
Ischnochiton rissoi (Payraudeau, 1826)	L5		+	
Callochiton septemvalvis (Montagu, 1803)	L2		+	
Lepidochitona cinerea (Linnaeus, 1767)	L23		+	
Lepidochitona caprearum (Scacchi, 1836)	L5		+	
Lepidochitona monterosatoi Kaas & Van Belle, 1981	L11		+	
Chitonidae				
Chiton corallinus (Risso, 1826)	L5		+	
Chiton olivaceus Spengler, 1797	L2		+	
Chiton phaseolinus Monterosato, 1879	L23			
Acanthochitonidae		2		
Acanthochitona crinita (Pennant, 1777)	L11	3		
Acanthochitona fascicularis (Linnaeus, 1767)	L2		+	
GASTROPODA				
Patellidae				
Patella caerulea Linnaeus, 1758	L1		+	
Patella rustica Linnaeus, 1758	L1		+	
Patella ulyssiponensis Gmelin, 1791	L9		+	
Lottiidae				
Tectura virginea (Müller O. F., 1776)	L2			
Lepetidae				
Propilidium scabrosum Jeffreys, 1883	L4			
Addisoniidae				
Addisonia lateralis (Réquien, 1848)	L9			
Neritidae				
Smaragdia souverbiana (Montrouzier, 1863)	L24	*		
Smaragdia viridis (Linnaeus, 1758)	L2		+	
Fissurellidae				
Fissurella nubecula (Linnaeus, 1758)	L4			
Diodora dorsata (Monterosato, 1878)	L23			
Diodora gibberula (Lamarck, 1822)	L4		+	
Diodora graeca (Linnaeus, 1758)	L4		+	
Diodora italica (Defrance, 1820)	L2		+	
Emarginula octaviana Coen, 1939	L2			
Emarginula sicula Gray, 1825	L2			
Emarginella huzardii (Payraudeau, 1826)	L9		+	
Scissurellidae				
Scissurella costata D'Orbigny, 1824	L11		+	
Anatoma crispata Fleming, 1828	L24		+	
Sinezona cingulata (Costa O. G., 1861)	L11			
Haliotidae				
Haliotis tuberculata tuberculata Linnaeus, 1758	L1	4	+	
Trochidae				
Trochus erythraeus Brocchi, 1826	L9	*	+	
Clanculus (Clanculus) corallinus (Gmelin, 1791)	L2		+	
Clanculus (Clanculopsis) cruciatus (Linnaeus, 1758)	L3		+	

Table 3 continued

SPECIES	L	N	R	Z
Clanculus (Clanculopsis) jussieui (Payraudeau, 1826)	L4			
Calliostoma conulus (Linnaeus, 1758)	L9		+	
Calliostoma laugieri laugieri (Payraudeau, 1826)	L2		+	
Calliostoma zizyphinum (Linnaeus, 1758)	L2			
Calliostoma granulatum (Von Born, 1778)	L2		+	
Gibbula ardens (Von Salis, 1793)	L1		+	
Gibbula magus (Linnaeus, 1758)	L3		+	
Gibbula adansonii (Payraudeau, 1826)	L4		+	
Gibbula turbinoides (Deshayes, 1835)	L9		+	
Gibbula fanulum (Gmelin, 1791)	L4		+	
Gibbula guttadauri (Philippi, 1836)	L9			
Gibbula leucophaea (Philippi, 1836)	L9			
Gibbula philberti (Recluz, 1843)	L11			
Gibbula richardi (Payraudeau, 1826)	L5		+	
Gibbula varia (Linnaeus, 1758)	L2		+	
Gibbula divaricata (Linnaeus, 1758)	L4		+	
Gibbula rarilineata (Michaud, 1829)	L9			
Gibbula umbilicaris nebulosa (Philippi, 1848)	L1	5	+	
Osilinus articulatus Lamarck, 1822	L1		+	
Osilinus mutabilis (Philippi, 1846)	L10			
Osilinus turbinatus (Von Born, 1778)	L1		+	
Clelandella miliaris (Brocchi, 1814)	L24			
Jujubinus exasperatus (Pennant, 1777)	L2		+	
Jujubinus striatus striatus (Linnaeus, 1758)	L3		+	
Colloniidae				
Cantrainea peloritana (Cantraine, 1835)	L9			
Homalopoma carmelae Oliverio & Buzzurro, 1994	L19			
Homalopoma sanguineum (Linnaeus, 1758)	L2		+	
Tricoliidae				
Tricolia pullus pullus (Linnaeus, 1758)	L2		+	
Tricolia speciosa (Von Muehlfeldt, 1824)	L2			
Tricolia tenuis (Michaud, 1829)	L9		+	
Turbinidae				
Bolma rugosa (Linnaeus, 1758)	L7		+	
Cerithiidae				
Cerithium alucaster (Brocchi, 1814)	L9			
Cerithium haustellum Monterosato in Crema, 1903	L24			
Cerithium lividulum Risso, 1826	L24			
Cerithium nesioticum Pilsbry & Vanatta, 1906	L11	*		
Cerithium protractum Bivona Ant. in Bivona And., 1838	L24		+	
Cerithium rupestre Risso, 1826	L1		+	
Cerithium scabridum Philippi, 1848	L15	*	+	
Cerithium vulgatum Bruguière, 1792	L1		+	
Bittium jadertinum (Brusina, 1865)	L11		+	
Bittium latreillii (Payraudeau, 1826)	L9		+	
Bittium reticulatum (Da Costa, 1778)	L2		+	
Bittium scabrum (Olivi, 1792)	L23			
Rhinoclavis kochi (Philippi, 1848)	L4	*		
Fossaridae				
Fossarus ambiguus (Linnaeus, 1758)	L11			
Obtortionidae				
Finella pupoides Adams, A., 1860	L23	*	+	
Clathrofenella fusca (Adams, A., 1860)	L21	*	+	
Potamididae				

Table 3 continued

SPECIES	L	N	R	Z
Pirenella conica (Blainville, 1826)	L9		+	
Siliquariidae				
Tenagodus obtusus (Schumacher, 1817)	L3			
Turritellidae				
Turritella communis Risso, 1826	L2		+	
Turritella turbona Monterosato, 1877	L2			
Littorinidae				
Melarhaphe neritoides (Linnaeus, 1758)	L1	6	+	
Nodilittorina (Echinolittorina) punctata (Gmelin, 1791)	**FR**		+	2
Cingulopsidae				
Eatonina fulgida (Adams, J., 1797)	L11			
Rissoidae				
Rissoa angustior (Monterosato, 1917)	L23			
Rissoa auriformis pseudomonodonta Verduin, 1983	L12			
Rissoa auriscalpium (Linnaeus, 1758)	L9			
Rissoa decorata Philippi, 1846	L23			
Rissoa guerinii Récluz, 1843	L9		+	
Rissoa italiensis Verduin, 1985	L23			
Rissoa labiosa (Montagu, 1803)	L23			
Rissoa lia (Monterosato, 1884, ex Benoit ms.)	L9			
Rissoa monodonta Philippi, 1836	L9		+	
Rissoa rodhensis Verduin, 1985	L23		+	
Rissoa scurra (Monterosato, 1917)	L11		+	
Rissoa similis Scacchi, 1836	L9		+	
Rissoa splendida Eichwald, 1830	**FR**		+	3
Rissoa variabilis (Von Muehlfeldt, 1824)	L9		+	
Rissoa ventricosa Desmarest, 1814	L2		+	
Rissoa violacea violacea Récluz, 1843	L9		+	
Alvania amatii Oliverio, 1986	L11	7	+	
Alvania aspera (Philippi, 1844)	L9			
Alvania beani (Hanley in Thorpe, 1844)	L9			
Alvania beniamina (Monterosato, 1884)	L6			
Alvania cancellata (Da Costa, 1778)	L18		+	
Alvania chiarellii Cecalupo & Quadri, 1995	L21			
Alvania cimex (Linnaeus, 1758)	L1		+	
Alvania colossophilus Oberling, 1970	L11			
Alvania datchaensis Amati & Oliverio, 1987	L12			
Alvania discors (Allan, 1818)	L9		+	
Alvania dorbignyi (Audouin, 1827)	L11	8		
Alvania fractospira Oberling, 1970	**FR**		+	4
Alvania geryonia (Nardo, 1847, ex Chiereghini ms.)	L11		+	
Alvania cf. *hallgassi* Amati & Oliverio, 1985	L11	25		
Alvania hispidula (Monterosato, 1884)	L24			
Alvania lactea (Michaud, 1832)	L18			
Alvania lanciae (Calcara, 1841)	L9			
Alvania lineata Risso, 1826	L9		+	
Alvania mamillata Risso, 1826	L8			
Alvania oranica (Pallary, 1900)	L11			
Alvania paupercula (Jeffreys, 1867)	L9			
Alvania rudis (Philippi, 1844)	L23			
Alvania scabra (Philippi, 1844)	L23		+	
Alvania sculptilis (Monterosato, 1877)	L23			
Alvania testae (Aradas & Maggiore, 1844)	**FR**		+	5
Cingula trifasciata (Adams J., 1800)	L9			

Table 3 continued

SPECIES	L	N	R	Z
Manzonia crassa (Kanmacher, 1798)	L11		+	
Manzonia weinkauffi jacobusi Oliverio, Amati & Nofroni, 1986	L23			
Obtusella macilenta (Monterosato, 1880)	L23			
Peringiella elegans (Locard, 1892)	L23			
Pusillina diversa (Nordsieck, 1972)	L23			
Pusillina inconspicua (Alder, 1844)	L23			
Pusillina lineolata (Michaud, 1832)	L9			
Pusillina margiminia (Nordsieck, 1972)	L23			
Pusillina marginata (Michaud, 1832)	L23			
Pusillina munda (Monterosato, 1884)	L23			
Pusillina philippi (Aradas & Maggiore, 1844)	L23		+	
Pusillina radiata (Philippi, 1836)	L11			
Setia ambigua (Brugnone, 1873)	L23			
Setia fusca (Philippi, 1841)	L23	9		
Setia slikorum (Verduin, 1984)	L23			
Setia turriculata Monterosato, 1884	L11			
Rissoina bruguieri (Payraudeau, 1826)	L9		+	
Rissoina bertholleti Issel, 1869	L11	*		
Adeorbidae				
Circulus striatus (Philippi, 1836)	L9			
Anabathridae				
Pisinna glabrata (Von Muhelfeldt, 1824)	L11			
Assimineidae				
Paludinella littorina (Delle Chiaje, 1828)	L11			
Paludinella cf. *sicana* (Brugnone, 1876)	L23			
Barleeidae				
Barleeia unifasciata (Montagu, 1803)	L9			
Caecidae				
Caecum auriculatum de Folin, 1868	L11		+	
Caecum trachea (Montagu, 1803)	L11		+	
Hydrobiidae				
Hydrobia acuta (Draparnaud, 1805)	**FR**		+	6
Tornidae				
Tornus subcarinatus (Montagu, 1803)	L9		+	
Truncatellidae				
Truncatella subcylindrica (Linnaeus, 1767)	L2		+	
Strombidae				
Strombus persicus Swainson, 1821	L9	*	+	
Aporrhaiidae				
Aporrhais pespelecani (Linnaeus, 1767)	L2		+	
Crepidulidae		10		
Crepidula unguiformis Lamarck, 1822	L2			
Capulidae				
Capulus hungaricus (Linnaeus, 1758)	L2			
Vermetidae				
Vermetus cristatus Biondi, 1857	L9			
Vermetus rugulosus Monterosato 1878	L23			
Vermetus triquetrus Bivona Ant., 1832	L2		+	
Vermetus cf. *granulatus* (Gravenhorst, 1831)	L24			
Vermetus cf. *semisurrectus* Bivona Ant., 1832	L24			
Vermetus sp.	L23			
Dendropoma anguliferum (Monterosato, 1884)	L11			
Dendropoma petraeum (Monterosato, 1884)	L2			
Petaloconchus glomeratus (Linnaeus, 1758)	L7			

Table 3 continued

SPECIES	L	N	R	Z
Serpulorbis arenaria (Linnaeus, 1767)	L1		+	
Cypraeidae		11		
Erosaria spurca (Linnaeus, 1758)	L2		+	
Luria lurida (Linnaeus, 1758)	L2			
Lamellariidae				
Lamellaria latens (Müller O. F., 1776)	L9			
Lamellaria perspicua (Linnaeus, 1758)	L3			
Triviidae				
Trivia arctica (Pulteney, 1789)	L1			
Trivia levantina Smriglio, Mariottini & Buzzurro, 1998	L27		+	
Trivia pulex (Solander in Gray, 1828)	L2			
Naticidae				
Natica dillwynii Payraudeau, 1826	L1		+	
Natica hebraea (Martyn, 1784)	L7		+	
Natica stercusmuscarum (Gmelin, 1791)	L7		+	
Tecnonatica filosa (Philippi, 1845)	L18			
Tecnonatica rizzae (Philippi, 1844)	L9			
Euspira guillemini (Payraudeau, 1826)	L18			
Euspira pulchella (Risso, 1826)	L7		+	
Neverita josephinia Risso, 1826	L7		+	
Payraudeautia intricata (Donovan, 1804)	L9			
Tonnidae				
Tonna galea (Linnaeus, 1758)	L2		+	
Cassidae				
Galeodea echinophora (Linnaeus 1758)	L2		+	
Galeodea rugosa (Linné, 1771)	L3			
Phalium granulatum (Von Born, 1778)	L3		+	
Phalium saburon (Bruguière, 1792)	L2			
Ranellidae				
Ranella olearia (Linnaeus, 1758)	L9			
Cymatium corrugatum corrugatum (Lamarck, 1816)	L2			
Cymatium parthenopeum parthenopeum (Von Salis, 1793)	L9			
Cabestana cutacea cutacea (Linnaeus, 1767)	L9			
Charonia lampas lampas (Linnaeus, 1758)	L3			
Charonia variegata (Lamarck, 1816)	L2	12	+	
Atlantidae				
Atlanta peronii Lesueur, 1817	L24			
Oxygyrus keraudrenii (Lesueur, 1817)	L24			
Protatlanta souleyeti (Smith E. A., 1888)	**FR**		+	7
Firolidae				
Firoloida desmarestia Lesueur, 1817	L13			
Pterotrachea hippocampus Philippi, 1836	L13			
Pterotrachea minuta Bonnevie, 1920	L13			
Triphoridae				
Cheirodonta pallescens (Jeffreys, 1867)	L23			
Marshallora adversa (Montagu 1803)	L15		+	
Monophorus perversus (Linnaeus, 1758)	L2		+	
Similiphora similior (Bouchet & Guillemot, 1978)	L23			
Metaxia bacillum (Issel, 1869)	L21	*		
Metaxia metaxa (Delle Chiaje, 1828)	L13			
Cerithiopsidae				
Cerithiopsis diadema Monterosato, 1864, ex Watson ms.	L24			
Cerithiopsis fayalensis Watson, 1886	L23			
Cerithiopsis minima (Brusina, 1865)	L23		+	

Table 3 continued

SPECIES	L	N	R	Z
Cerithiopsis nana Jeffreys, 1867	L23			
Cerithiopsis pulvis (Issel, 1869)	L11	*		
Cerithiopsis scalaris Locard, 1892, ex Monterosato ms.	FR		+	8
Cerithiopsis tenthrenois (Melvill, 1869)	L24	*		
Cerithiopsis tubercularis (Montagu, 1803)	L11		+	
Krachia tiara Monterosato, 1874, ex Watson ms.	L23			
Dizoniopsis bilineata (Hörnes, 1848)	L11			
Dizoniopsis coppolae (Aradas, 1870)	L23			
Seila trilineata (Philippi, 1836)	L9			
Janthinidae				
Janthina janthina (Linnaeus, 1758)	L9			
Janthina nitens Menke, 1828	L2			
Cimidae				
Cima cylindrica (Jeffreys, 1858)	L11			
Epitoniidae				
Epitonium algerianum (Weinkauff, 1866)	L23			
Epitonium clathratulum (Kanmacher, 1798)	L3			
Epitonium commune (Lamarck, 1822)	L9		+	
Epitonium turtoni (Turton, 1819)	L4			
Cycloscala hyalina (Sowerby G. B. II, 1844)	L17	*		
Gyroscala lamellosa (Lamarck, 1822)	L2			
Opalia hellenica (Forbes, 1844)	L23		+	
Eulimidae				
Crinophtheiros comatulicola (Graff, 1875)	L11			
Ersilia mediterranea (Monterosato, 1869)	L11			
Eulima bilineata Alder, 1848	L25		+	
Eulima glabra (Da Costa, 1778)	L2		+	
Melanella boscii (Payraudeau, 1827)	L23			
Melanella monterosatoi (Monterosato, 1890, ex De Boury ms.)	L23			
Melanella polita Linnaeus, 1758)	L11			
Parvioris ibizenca (Nordsieck, 1968)	L23			
Nanobalcis nana (Monterosato, 1878)	L24			
Sabinella piriformis Brugnone, 1873	L24			
Sticteulima lentiginosa (Adams A., 1861)	L24	*		
Sticteulima jeffreysiana (Brusina, 1869)	L23			
Vitreolina curva (Monterosato, 1874, ex Jeffreys ms.)	L9		+	
Vitreolina devians Monterosato, 1875	L24			
Vitreolina incurva (B. D. D., 1883)	L11			
Vitreolina levantina Oliverio, Buzzurro & Villa, 1994	L20			
Vitreolina perminima (Jeffreys, 1883)	L9			
Vitreolina philippi (Rayneval & Ponzi, 1854)	L9		+	
Muricidae				
Aspella anceps (Lamarck, 1822)	L4	*		
Bolinus brandaris (Linnaeus, 1758)	L2		+	
Dermomurex scalaroides (Blainville, 1829)	L23			
Hadriania oretea (De Gregorio, 1885)	L4			
Hexaplex trunculus (Linnaeus, 1758)	L2		+	
Murexsul aradasii (Poirier, 1883, ex Monterosato ms.)	L9			
? *Muricopsis cevikeri* Houart, 2000	L28			
Muricopsis cristata (Brocchi, 1814)	L2		+	
Ocenebra erinaceus (Linnaeus, 1758)	L4		+	
Ocinebrina aciculata (Lamarck, 1822)	L3		+	
Ocinebrina edwardsii (Payraudeau, 1826)	L4		+	
Ocinebrina hispidula (Pallary, 1904)	L23			

Table 3 continued

SPECIES	L	N	R	Z
Ocinebrina hybrida (Aradas & Benoit, 1876)	L11			
Typhinellus sowerbyi (Broderip, 1833)	L4			
Ergalatax obscura Houart, 1996	L24	*		
Thais lacera (Born, 1778)	L28	*		
Stramonita haemastoma (Linnaeus, 1766)	L2		+	
Coralliophila meyendorffii (Calcara, 1845)	L4			
Hirtomurex squamosa (Bivona And., 1838)	L9			
Babelomurex babelis (Requién, 1848)	L3			
Buccinidae				
Buccinulum corneum (Linnaeus, 1758)	L2		+	
Chauvetia candidissima (Philippi, 1836)	L18			
Chauvetia recondita (Brugnone, 1873)	L23			
Engina leucozona (Philippi, 1843)	L4		+	
Pisania striata (Gmelin, 1791)	L2		+	
Pollia dorbignyi (Payraudeau, 1826)	L7		+	
Pollia scabra Locard, 1886	L9			
Pollia scacchiana (Philippi, 1844)	L9		+	
Colubraria reticulata (Blainville, 1826)	L3			
Columbellidae				
Columbella rustica (Linnaeus, 1758)	L1		+	
Anachis savignyi (Moazzo, 1939, ex Jousseaume ms.)	L24	*	+	
Anachis troglodytes (Sowerbie G. B. I & Montrouzier, 1866)	L23	*		
Mitrella cf. *bruggeni* Aartsen, Menkhorst & Gittenberg, 1984	L23			
Mitrella gervillii (Payraudeau, 1826)	L9		+	
Mitrella minor (Scacchi, 1836)	L11			
Mitrella scripta (Linnaeus, 1758)	L2		+	
Nassariidae				
Nassarius corniculus (Olivi, 1792)	L2			
Nassarius incrassatus (Stroem, 1768)	L7		+	
Nassarius reticulatus (Linnaeus, 1758)	L2			
Nassarius circumcictus (Adams A., 1852)	**FR**		+	9
Nassarius gibbosulus (Linnaeus, 1758)	L2		+	
Nassarius mutabilis (Linnaeus, 1758)	L2		+	
Nassarius cuvierii (Payraudeau, 1826)	L9		+	
Nassarius louisi (Pallary, 1912)	L9		+	
Nassarius lima (Dillwyn, 1817)	L9			
Cyclope neritea (Linnaeus, 1758)	L2		+	
Fasciolariidae				
Fasciolaria lignaria (Linnaeus, 1758)	L2		+	
Fusinus sanctaeluciae (Von Salis, 1793)	L2		+	
Fusinus rudis (Philippi, 1844)	L9			
Fusinus syracusanus (Linnaeus, 1758)	L2		+	
Costellariidae		13		
Vexillum ebenus (Lamarck, 1811)	L2		+	
Vexillum littorale (Forbes, 1844)	L9		+	
Vexillum savignyi (Payraudeau, 1826)	L9			
Vexillum tricolor (Gmelin, 1790)	L3		+	
Marginellidae				
Volvarina mitrella (Risso, 1826)	L4		+	
Cystiscidae				
Gibberula miliaria (Linnaeus, 1758)	L2		+	
Gibberula philippii (Monterosato, 1878)	L11		+	
Granulina boucheti Gofas, 1992	**FR**		+	10
Granulina marginata (Bivona, 1832)	L23	14		

Table 3 continued

SPECIES	L	N	R	Z
Granulina occulta (Monterosato, 1869)	L11			
Mitridae				
Mitra cornicula (Linnaeus, 1758)	L2		+	
Mitra zonata Marryat, 1818	L9			
Cancellariidae				
Cancellaria cancellata (Linnaeus, 1767)	L4			
Turridae				
Haedropleura septangularis (Montagu, 1803)	L18			
Conidae				
Conus mediterraneus Hwass in Bruguière, 1792	L1		+	
Bela cf. *cycladensis* (Reeve, 1845)	L24			
Bela laevigata (Philippi, 1836)	L15		+	
Bela menkhorsti Aartsen, 1988	L15			
Bela nebula (Montagu, 1803)	L3		+	
Bela ornata (Locard, 1897)	L23			
Bela taprurensis (Pallary, 1904)	L11		+	
Clathromangelia granum (Philippi, 1844)	L9	15		
Gymnobela subaraneosa (Dautzenberg & Fischer H. , 1896)	**FR**		+	11
Mangelia attenuata (Montagu, 1803)	L3		+	
Mangelia barashi (Aartsen & Fehr de Wal, 1978)	L11		+	
Mangelia bertrandii (Payraudeau, 1826)	L11			
Mangelia costulata (Blainville, 1829)	L3			
Mangelia fieldeni (Aartsen & Fehr de Wal, 1978, ex Mont. ms.)	L11	16	+	
Mangelia cf. *pallary* (Nordsieck, 1977)	L11			
Mangelia sandrii (Brusina, 1865)	L23			
Mangelia secreta (Aartsen & Fehr de Wal, 1978, ex Mont. ms.)	L23			
Mangelia sicula Reeve, 1846	L23			
Mangelia taeniata (Deshayes, 1835)	L3		+	
Mangelia unifasciata (Deshayes, 1835)	L7		+	
Mangelia vauquelini (Payraudeau, 1826)	L9			
Taranis moerchi (Malm, 1863)	L24			
Mitrolumna olivoidea (Cantraine, 1835)	L3		+	
Raphitoma alternans (Monterosato, 1884)	L24			
Raphitoma cf. *atropurpurea* (Locard & Caziot, 1900, ex Mont. ms.)	L24			
Raphitoma bicolor (Risso, 1826)	L7			
Raphitoma concinna (Scacchi, 1836)	L9			
Raphitoma cordieri (Payraudeau, 1826)	L24			
Raphitoma echinata (Brocchi, 1814)	L9			
Raphitoma laviae (Philippi, 1844)	L23		+	
Raphitoma linearis (Montagu, 1803)	L9		+	
Raphitoma papillosa (Pallary, 1904)	L24			
Raphitoma philberti (Michaud, 1829)	L11		+	
Raphitoma pruinosa (Pallary, 1906)	L24			
Raphitoma pupoides (Monterosato, 1884)	L23			
Leufroya leufroyi (Michaud, 1828)	L11			
Comarmondia gracilis (Montagu, 1803)	L13		+	
Teretia teres (Reeve, 1844)	**FR**		+	12
Drilliidae				
Crassopleura incrassata (Dujardin, 1837)	L9		+	
Mathildidae				
Mathilda gemmulata Semper, 1865	L9			
Rissoellidae				
Rissoella inflata Locard, 1892	L11			
Omalogyridae				

Table 3 continued

SPECIES	L	N	R	Z
Omalogyra atomus (Philippi, 1841)	L11			
Ammonicera fischeriana (Monterosato, 1869)	L11		+	
Pyramidellidae				
Chrysallida clathrata (Jeffreys, 1848)	L9			
Chrysallida decorata (Philippi, 1849)	L24	*17		
Chrysallida decussata (Montagu, 1803)	L24			
Chrysallida emaciata (Brusina, 1866)	L24			
Chrysallida indistincta (Montagu, 1808)	L11		+	
Chrysallida intermixta (Monterosato, 1884)	L11			
Chrysallida jeffreysiana (Monterosato, 1884, ex Seguenza G. ms.)	L11			
Chrysallida juliae (de Folin, 1872)	**FR**		+	13
Chrysallida limitum (Brusina, 1876)	L23			
Chrysallida obtusa (Brown T., 1827)	L11		+	
Chrysallida sp. B	L14			
Chrysallida suturalis (Philippi, 1844)	L23			
Chrysallida terebellum (Philippi, 1844)	L14			
Clathrella clathrata (Philippi, 1844)	L18			
Euparthenia bulinea (Lowe, 1841)	L9			
Euparthenia humboldti (Risso, 1826)	L11		+	
Folinella excavata (Philippi, 1836)	L9		+	
Folinella ghisottii Aartsen, 1984	**FR**		+	14
Odostomella doliolum (Philippi, 1844)	L9			
Tragula fenestrata (Jeffreys, 1848)	**FR**		+	15
Adelactaeon amoenus (Adams A., 1851)	L23	*		
Eulimella acicula (Philippi, 1836)	L23		+	
Eulimella bogii Aartsen, 1984	**FR**		+	16
Eulimella cerullii (Cossmann, 1915)	L15			
Eulimella ventricosa (Forbes, 1844)	L24			
"Syrnola" fasciata Jickeli, 1882	L22	*		
Odostomia carrozzai Aartsen, 1987	L11			
Odostomia erjaveciana Brusina, 1869	L23			
Odostomia imponderabilior Oberling, 1970	L23		+	
Odostomia lukisii Jeffreys, 1859	L11			
Odostomia nofronii Buzzurro, 2002	L29		+	
Odostomia plicata (Montagu, 1803)	L11			
Odostomia scalaris Mac Gillivray, 1843	L23			
Odostomia striolata Forbes & Hanley, 1850	L23			
Odostomia turriculata Monterosato, 1869	L23			
Odostomia turrita Hanley, 1844	L11			
Odostomia unidentata (Montagu, 1803)	L11		+	
Megastomia conoidea (Brocchi, 1814)	L9	18	+	
Megastomia sicula Philippi, 1851	L23	18		
Liostomia clavula (Lovén, 1846)	L11			
Ondina crystallina Locard, 1892	L23			
Ondina vitrea (Brusina, 1866)	L23			
Ondina warreni (Thompson, 1845)	L11			
Turbonilla acuta (Donovan, 1804)	L24			
Turbonilla acutissima Monterosato, 1884	**FR**		+	17
Turbonilla delicata Monterosato, 1874	L10			
Turbonilla edgari (Melvill, 1896)	L23	*		
Turbonilla gradata B. D. D., 1883	L23			
Turbonilla lactea (Linnaeus, 1758)	L2			
Turbonilla pumila Seguenza, G., 1876	L23			
Turbonilla pusilla (Philippi, 1844)	L10			

Table 3 continued

SPECIES	L	N	R	Z
Turbonilla cf. *rosewateri* Corgan & Aartsen, 1993	L11			
Turbonilla rufa (Philippi, 1836)	L9		+	
Turbonilla sinuosa (Jeffreys, 1884)	L15			
Turbonilla striatula (Linnaeus, 1758)	L10		+	
Turbonilla cf. *syrtensis* Aartsen, 1981	L11			
Anisocyclidae				
Anisocycla folini (Fischer P. in de Folin, 1869)	L11	19		
Anisocycla nitidissima (Montagu, 1803)	L24			
Anisocycla pointeli (de Folin, 1867)	L11			
Acteonidae				
Acteon tornatilis (Linnaeus, 1758)	L2		+	
Crenilabium exile (Jeffreys, 1870, ex Forbes ms.)	L18	20		
Retusidae				
Pyrunculus fourierii (Audouin, 1826)	L23	*		
Retusa leptoeneilema (Brusina, 1866)	L11			
Retusa mammillata (Philippi, 1836)	L15			
Retusa truncatula (Bruguière, 1792)	L3		+	
Ventomnestia girardi (Áudouin, 1826)	L23	*		
Cylichnina crebrisculpta Monterosato, 1884	L23			
Cylichnina laevisculpta (Granata-Grillo, 1877)	L23			
Cylichnina multiquadrata (Oberling, 1970)	L24	21		
Cylichnina umbilicata (Montagu, 1803)	L2			
Volvulella acuminata (Bruguière, 1792)	L9			
Ringiculidae				
Ringicula auriculata (Ménard de la Groye, 1811)	L9			
Ringicula conformis Monterosato, 1877	L4		+	
Bullidae				
Bulla striata Bruguière, 1792	L2		+	
Haminoeidae				
Haminoea hydatis (Linnaeus, 1758)	L2			
Haminoea navicula (Da Costa, 1778)	L9			
Haminoea orbignyana (Férrussac, 1822)	L11			
Atys jeffreysi (Weinkauff, 1868)	L23		+	
Weinkauffia turgidula (Forbes, 1844)	L11		+	
Smaragdinellidae				
Smaragdinella algirae (Adams A. in Sowerby G. B. II, 1850)	L23			
Philinidae				
Philine aperta (Linnaeus, 1767)	L2		+	
Philine catena (Montagu, 1803)	L11			
Philine punctata (Adams J., 1800)	L10			
Aglajidae				
Philinopsis depicta (Renier, 1804)	L10			
Akeridae				
Akera bullata Müller O. F., 1776	L4			
Cylichnidae				
Cylichna crossei B. D. D., 1886	L10			
Cylichna cylindracea (Pennant, 1777)	L9		+	
Acteocina mucronata (Philippi, 1849)	L17	*		
Roxania utriculus (Brocchi, 1814)	L10			
Scaphander lignarius (Linnaeus, 1758)	L25		+	
Gastropteridae				
Gastropteron meckeli Kosse, 1813	L3			
Cavolinidae				
Cavolinia gibbosa gibbosa (D' Orbigny, 1835, ex Rang ms.)	L13			

Table 3 continued

SPECIES	L	N	R	Z
Cavolinia tridentata (Niebuhr, 1775, ex Forskâl ms.)	L9		+	
Clio cuspidata (Bosc, 1802)	L9			
Clio pyramidata lanceolata (Leseur, 1813)	L9			
Creseis acicula Rang, 1828	L13			
Hyalocylis striata (Rang, 1828)	L13			
Styliola subula (Quoy & Gaimard, 1827)	L10			
Limacinidae				
Limacina trochiformis (D' Orbigny, 1836)	L11			
Limacina inflata (D' Orbigny, 1836)	L11		+	
Oxynoidae				
Oxynoe olivacea Rafinesque, 1814	L4			
Lobiger serradifalci (Calcara, 1840)	L25			
Volvatellidae				
Ascobulla fragilis (Jeffreys, 1856)	L24			
Elyssidae				
Elysia timida (Risso, 1818)	L10			
Thuridilla hopei (Vérany, 1853)	L4			
Umbraculidae				
Umbraculum umbraculum (Röding, 1798)	L2		+	
Tylodinidae				
Tylodina perversa (Gmelin, 1791)	L23			
Pleurobranchidae				
Pleurobranchus membranaceus (Montagu, 1815)	L9			
Berthella ocellata (Delle Chiaje, 1830)	L10			
Berthellina citrina (Rueppell & Leuckart, 1830)	L11			
Berthellina engeli Gardiner, 1936	L10			
Pleurobranchaea meckelii Meckel in Leue, 1813	L2			
Pleurobranchus testudinarius Cantraine, 1835	L10			
Aplysidae				
Aplysia depilans Gmelin, 1791	L2		+	
Aplysia parvula Guilding in Mörch, 1863	L10			
Aplysia punctata (Cuvier, 1803)	L11			
Aplysia fasciata Poiret, 1789	L4			
Dolabriferidae				
Petalifera gravieri (Vayssière, 1906)	L23			
Notarchus punctatus Philippi, 1836	L10			
Aegiretidae				
Aegires punctilucens (D' Orbigny, 1837)	L10			
Triophidae				
Kaloplocamus ramosus (Cantraine, 1835)	L10			
Chromodorididae				
Hypselodoris tricolor (Cantraine, 1835)	L4			
Hypselodoris villafranca (Risso, 1818)	L4			
Discodorididae				
Discodoris atromaculata (Bergh, 1880)	L2			
Dendrodorididae				
Dendrodoris grandiflora (Rapp, 1827)	L4			
Doriopsilla areolata Bergh, 1880	L10			
Tethyidae				
Tethys fimbria Linnaeus, 1767	L10			
Zephyrinidae				
Janolus cristatus (Delle Chiaje, 1841)	L4			
Flabellinidae				

Table 3 continued

SPECIES	L	N	R	Z
Flabellina affinis (Gmelin, 1791)	L4			
Siphonariidae				
Siphonaria pectinata (Linnaeus, 1758)	L9			
Williamia gussonii (Costa O. G., 1829)	L11		+	
Trimusculidae				
Trimusculus mammillaris (Linnaeus, 1758)	L9			
Melampidae				
Auriculinella erosa (Jeffreys, 1830)	L18			
Ovatella firminii (Payraudeau, 1826)	L11		+	
Ovatella denticulata (Montagu, 1803)	L23			
Ovatella myosotis (Draparnaud, 1801)	L2			
BIVALVIA				
Solemyidae				
Solemya togata (Poli, 1791)	L9		+	
Nuculidae				
Nucula nitidosa Winckworth, 1931	L11		+	
Nucula nucleus (Linnaeus, 1758)	L3		+	
Nucula sulcata Bronn, 1831	L4		+	
Nuculoma tenuis (Montagu, 1808)	L11			
Nuculanidae				
Lembulus pellus (Linnaeus, 1758)	L3		+	
Saccella commutata (Philippi, 1844)	L3		+	
Arcidae				
Arca noae Linnaeus, 1758	L1		+	
Arca tetragona Poli, 1795	L9			
Barbatia barbata (Linnaeus, 1758)	L1		+	
Acar plicata (Dillwyn, 1817)	L18			
Anadara corbuloides (Monterosato, 1878)	L9			
Anadara polii (Mayer, 1868)	L3			
Bathyarca pectunculoides (Scacchi, 1834)	L24			
Striarca lactea (Linnaeus, 1758)	L3		+	
Glycymerididae				
Glycymeris bimaculata (Poli, 1795)	L9		+	
Glycymeris glycymeris (Linnaeus, 1758)	L3		+	
Glycymeris insubrica (Brocchi, 1814)	L3		+	
Mytilidae				
Mytilus galloprovincialis Lamarck, 1819	L3		+	
Brachidontes pharaonis (Fischer P., 1870)	L9	*	+	
Mytilaster minimus (Poli, 1795)	L11		+	
Crenella arenaria Monterosato, 1875, ex Martin H. ms.	L11		+	
Gregariella petagnae (Scacchi, 1832)	L9		+	
Modiolarca subpicta (Cantraine, 1835)	L4		+	
Musculus costulatus (Risso, 1826)	L4		+	
Lithophaga lithophaga (Linnaeus, 1758)	L3		+	
Modiolus barbatus (Linnaeus, 1758)	L3		+	
Modiolus adriaticus (Lamarck, 1819)	L3		+	
Modiolula phaseolina (Philippi, 1844)	L20		+	
Pinnidae				
Pinna nobilis Linnaeus, 1758	L3		+	
Pteriidae				
Pteria hirundo (Linnaeus, 1758)	L4		+	
Pinctada radiata (Leach, 1814)	L3	*	+	
Malleidae				
Malleus regula (Forskål, 1775)	L3	*22	+	

Table 3 continued

SPECIES	L	N	R	Z
Malleus sp.	L23	*		
Pectinidae				
Pecten jacobaeus (Linnaeus, 1758)	L3		+	
Aequipecten opercularis (Linnaeus, 1758)	L7		+	
Pseudamussium septemradiatum (Müller O. F., 1776)	L3			
Pseudamussium clavatum (Poli, 1795)	L9		+	
Similpecten similis (Laskey, 1811)	L13			
Palliolum incomparabile (Risso, 1826)	L9		+	
Crassadoma multistriata (Poli, 1795)	L9			
Mimachlamys varia (Linnaeus, 1758)	L3		+	
Manupecten pesfelis (Linnaeus, 1758)	L3			
Flexopecten flexuosus (Poli, 1795)	L3		+	
Flexopecten glaber (Linnaeus, 1758)	L9		+	
Lissopecten hyalinus (Poli, 1795)	L3			
Spondylidae				
Spondylus gaederopus Linnaeus, 1758	L3		+	
Anomiidae				
Anomia ephippium Linnaeus, 1758	L3		+	
Limidae				
Lima lima (Linnaeus, 1758)	L3		+	
Limaria hians (Gmelin, 1791)	L3		+	
Limaria loscombi (Sowerby G. B. I, 1823)	**FR**		+	18
Limaria tuberculata (Olivi, 1792)	L23			
Limatula gwyni (Sykes, 1903)	L9			
Limatula subauriculata (Montagu, 1808)	L18			
Ostreidae				
Ostrea edulis Linnaeus, 1758	L3		+	
Ostreola stentina (Payraudeau, 1826)	L24			
Gryphaeidae				
Neopycnodonte cochlear (Poli, 1795)	L9			
Lucinidae				
Ctena decussata (Costa O. G., 1829)	L4		+	
Loripes lucinalis (Lamarck, 1818)	L3		+	
Megaxinus unguiculinus Pallary, 1904	L12			
Divaricella angulifera Von Martens, 1880	L16			
Lucinella divaricata (Linnaeus, 1758)	L9		+	
Anadontia fragilis (Philippi, 1836)	L9		+	
Myrtea spinifera (Montagu, 1803)	L3		+	
Thyasiridae				
Thyasira biplicata (Philippi,1836)	L3		+	
Thyasira planata (Jeffreys, 1882)	L25			
Axinulus croulinensis (Jeffreys, 1847)	L25			
Axinulus cycladius (Wood S., 1848)	L9			
Leptaxinus cf. *subovatus* (Jeffreys, 1881)	L24			
Ungulinidae				
Diplodonta apicalis Philippi, 1836	L23			
Chamidae				
Chama gryphoides Linnaeus, 1758	L3		+	
Pseudochama corbierei (Jonas, 1846)	L3	*		
Pseudochama gryphina (Lamarck, 1819)	L9		+	
Kelliidae				
Bornia sebetia (Costa O. G., 1829)	L9			
Montacutidae				
Tellimya ferruginosa (Montagu, 1808)	L25			

Table 3 continued

SPECIES	L	N	R	Z
Carditidae				
Cardita calyculata (Linnaeus, 1758)	L3		+	
Glans trapezia (Linnaeus, 1767)	L3		+	
Glans elegans (Réquien, 1848)	L4		+	
Pteromeris jozinae Aartsen, 1984	L11			
Pteromeris minuta (Scacchi, 1836)	L23			
Cardites antiquatus (Linnaeus, 1758)	L3		+	
Astartidae				
Astarte fusca (Poli, 1791)	L3		+	
Astarte sulcata (Da Costa, 1778)	L9			
Cardiidae				
Acanthocardia aculeata (Linnaeus, 1758)	L4		+	
Acanthocardia echinata (Linnaeus, 1758)	L3		+	
Acanthocardia paucicostata (Sowerby G. B. II, 1834)	L1		+	
Acanthocardia tuberculata (Linnaeus, 1758)	L1		+	
Parvicardium exiguum (Gmelin, 1791)	L4		+	
Parvicardium ovale (Sowerby G. B. II, 1840)	L3			
Parvicardium scabrum (Philippi, 1844)	L18			
Parvicardium scriptum (B. D. D., 1892)	L11			
Parvicardium trapezium Cecalupo & Quadri, 1996	L23			
Plagiocardium papillosum (Poli, 1791)	L3		+	
Laevicardium crassum (Gmelin, 1791)	L9			
Laevicardium oblongum (Gmelin, 1791)	L3		+	
Cerastoderma edule (Linnaeus, 1758)	L3		+	
Cerastoderma glaucum (Poiret, 1789)	L3			
Fulvia fragilis (Forskâl in Niebuhr, 1775)	L16	*		
Mactridae				
Mactra stultorum (Linnaeus, 1758)	L3		+	
Mesodesmatidae				
Donacilla cornea (Poli, 1791)	L7		+	
Solenidae				
Solen marginatus Pulteney, 1799	L3		+	
Pharidae				
Ensis arcuatus (Jeffreys, 1865)	L18			
Ensis ensis (Linnaeus, 1758)	L3		+	
Ensis minor (Chenu, 1843)	L9		+	
Phaxas adriaticus (Coen, 1933)	L25			
Phaxas pellucidus (Pennant, 1777)	L25			
Tellinidae				
Tellina compressa Brocchi, 1814	L23			
Tellina distorta Poli, 1791	L25			
Tellina donacina Linnaeus, 1758	L3		+	
Tellina fabula Gmelin, 1791	L9			
Tellina incarnata Linnaeus, 1758	L3		+	
Tellina nitida Poli, 1791	L3		+	
Tellina pygmaea Lovén, 1846	L25			
Tellina planata Linnaeus, 1758	L7		+	
Tellina pulchella Lamarck, 1818	L3		+	
Tellina serrata Brocchi, 1814	L13		+	
Tellina tenuis Da Costa, 1778	L9			
Arcopagia balaustina (Linnaeus, 1758)	L3		+	
Macoma cf. *balthica* (Linnaeus, 1758)	L24	23		
Gastrana fragilis (Linnaeus, 1758)	L3		+	
Donacidae				

Table 3 continued

SPECIES	L	N	R	Z
Donax semistriatus Poli, 1795	L3		+	
Donax venustus Poli, 1795	L3			
Donax trunculus Linnaeus, 1758	L3			
Psammobiidae				
Gari depressa (Pennant, 1777)	L7		+	
Semelidae				
Abra nitida (Müller O. F., 1776)	L18			
Abra prismatica (Montagu, 1808)	L25			
Abra segmentum (Récluz, 1843)	L25			
Abra tenuis (Montagu, 1803)	L3		+	
Abra alba (Wood W., 1802)	L9		+	
Abra longicallus (Scacchi, 1834)	L25			
Solecurtidae				
Solecurtus strigilatus (Linnaeus, 1758)	L3		+	
Azorinus chamasolen (Da Costa, 1778)	L3		+	
Kelliellidae				
Kelliella abyssicola (Forbes, 1844)	FR		+	19
Glossidae				
Glossus humanus (Linnaeus, 1758)	L3		+	
Veneridae				
Venus verrucosa Linnaeus, 1758	L3		+	
Venus casina Linnaeus, 1758	L9		+	
Globivenus effosa (Philippi, 1836, ex Bivona ms.)	L25			
Chamelea gallina (Linnaeus, 1758)	L3		+	
Clausinella fasciata (Da Costa, 1778)	L9		+	
Timoclea ovata (Pennant, 1777)	L3		+	
Gouldia minima (Montagu, 1803)	L3		+	
Dosinia lupinus (Linnaeus, 1758)	L3		+	
Dosinia exoleta (Linnaeus, 1758)	L9		+	
Pitar rudis (Poli, 1795)	L9		+	
Callista chione (Linnaeus, 1758)	L3		+	
Ruditapes decussatus (Linnaeus, 1758)	L1	24	+	
Irus irus (Linnaeus, 1758)	L3		+	
Paphia aurea (Gmelin, 1791)	L1		+	
Paphia lucens (Locard, 1886)	L1		+	
Paphia rhomboides (Pennant, 1777)	L9		+	
Venerupis senegalensis (Gmelin, 1791)	L3		+	
Petricolidae				
Petricola lithophaga (Retzius, 1786)	L3		+	
Petricola substriata (Montagu, 1808)	L9			
Petricola lajonkairii (Payraudeau, 1826)	L9		+	
Mysia undata (Pennant, 1777)	L9		+	
Corbulidae				
Corbula gibba (Olivi, 1792)	L7		+	
Gastrochaenidae				
Gastrochaena dubia (Pennant, 1777)	L7		+	
Hiatellidae				
Hiatella arctica (Linnaeus, 1767)	L9		+	
Pholadidae				
Pholas dactylus Linnaeus, 1758	L4		+	
Barnea candida (Linnaeus, 1758)	L3		+	
Teredinidae				
Teredo navalis Linnaeus, 1758	L9			
Teredo utriculus Gmelin, 1791	L3			

Table 3 continued

SPECIES	L	N	R	Z
Lyrodus pedicellatus (Quatrefages, 1849)	L13			
Nototeredo norvegica (Spengler, 1792)	L18			
Thraciidae				
Thracia papyracea (Poli, 1791)	L9			
Thracia pubescens (Pulteney, 1799)	L3			
Clavagellidae				
Clavagella melitensis Broderip, 1835	L9			
Pandoridae				
Pandora inaequivalvis (Linnaeus, 1758)	L9			
Lyonsiidae				
Lyonsia norwegica (Gmelin, 1791)	L25			
Cuspidariidae				
Cuspidaria cuspidata (Olivi, 1792)	L3		+	
Cuspidaria rostrata (Spengler, 1793)	L3		+	
Cardiomya costellata (Deshayes, 1835)	L3		+	
SCAPHOPODA				
Dentaliidae				
Antalis dentalis (Linnaeus, 1758)	L3			
Antalis entalis (Linnaeus, 1758)	L23			
Antalis panorma (Chenu, 1842)	L4			
Antalis rossati (Caprotti, 1966)	L13			
Antalis vulgaris (Da Costa, 1778)	L2		+	
Fustiariidae				
Fustiaria rubescens (Deshayes, 1826)	L2		+	
Gadilidae				
Dischides politus (Wood S., 1842)	L18			
Entalinidae				
Entalina tetragona (Brocchi, 1814)	L13			
CEPHALOPODA				
Sepiidae				
Sepia elegans Blainville 1827	L2			
Sepia officinalis Linnaeus, 1758	L2			
Sepia orbignyana Férussac in D' Orbigny, 1826	L26			
Sepiolidae				
Sepiola robusta Naef, 1912	L26			
Sepiola rondeleti Leach, 1817	L2			
Sepiola steenstrupiana Levy, 1912	L26			
Sepietta oweniana (D' Orbigny, 1840)	L26			
Sepietta neglecta Naef, 1916	L26			
Loliginidae				
Loligo forbesii Steenstrup, 1856	L26			
Loligo vulgaris Lamarck, 1798	L2			
Alloteuthis media (Linnaeus, 1758)	L26			
Ommastrephidae				
Illex coindetii (Vérany 1839)	L4			
Todaropsis eblanae (Ball, 1841)	L26			
Todarodes sagittatus (Lamarck, 1798)	L2			
Octopodidae				
Octopus macropus Risso, 1826	L2			
Octopus salutii Vérany, 1839	L26			
Octopus vulgaris Cuvier, 1798	L2			
Scaeurgus unicirrhus (Delle Chiaje in Férussac & D' Orbigny, 1840)	L26			

Table 3 continued

SPECIES	L	N	R	Z
Eledone moschata (Lamarck, 1798)	L2			
Argonautidae				
Argonauta argo Linnaeus, 1758	L2			

Literatur: **L1**: MONTEROSATO, 1899; **L2**: DEMETROPOULOS, 1969; **L3**: DEMETROPOULOS, 1971; **L4**: DEMETROPOULOS & HADJICHRISTOPHOROU, 1976; **L5**: BARASH & DANIN, 1977; **L6**: VERDUIN, 1984; **L7**: STAVRINOS, 1984; **L8**: VERDUIN, 1986; **L9**: TORNARITIS, 1987; **L10**: BARASH & DANIN, 1989; **L11**: BOGI *et al.*, 1989; **L12**: AARTSEN & KINZELBACH, 1990; **L13**: BARASH & DANIN, 1992; **L14**: LINDEN & EIKENBOOM, 1992; **L15**: FISCHER, 1993a; **L16**: FISCHER, 1993b; **L17**: CECALUPO & QUADRI, 1994; **L18**: FISCHER, 1994; **L19**: OLIVERIO & BUZZURRO, 1994; **L20**: OLIVERIO *et al.*, 1994; **L21**: CECALUPO & QUADRI, 1995; **L22**: NOFRONI & TRINGALI, 1995; **L23**: CECALUPO & QUADRI, 1996; **L24**: BUZZURRO & GREPPI, 1997; **L25**: HADJICHRISTOPHOROU *et al.*, 1997; **L26**: SALMAN *et al.*, 1998; **L27**: SMRIGLIO *et al.*, 1998; **L28**: HOUART, 2001, **L29**: BUZZURRO, 2002.

NOTES

1: *Lepidopleurus boettgeri* Sulc, 1934 for the claimed synonymy with *L. bedulli* (Dell'Angelo & Palazzi, 1986), reported by CECALUPO & QUADRI (1996), see DELL'ANGELO & SMRIGLIO (1999).

2: *Acanthochitona aeneus* (Risso, 1826), reported by BOGI *et al.* (1989) is hard to consider, since the species belonging to this genus are only two according to DELL'ANGELO & SMRIGLIO (1999) and are already present in the checklist, so we prefer not to report it.

3: *Acanthochitona crinita oblonga* Leloup, 1981 reported by CECALUPO & QUADRI (1996) has been excluded: see DELL'ANGELO & SMRIGLIO (1999).

4: this is the correct name considering that *Haliotis lamellosa* Lamarck, 1822 is a synonym of *H. tuberculata*: see GEIGER (1998).

5: several Authors have reported this species, while others have identified it as *Gibbula umbilicaris* (Linnaeus, 1758). Anatomical studies are needed to definitively solved this taxonomical problem. Due to the lack of data, we are conservatively in line with the interpretation of MONTEROSATO (1899: 398), who wrote: *"Forme peu commune, voisine du G. umbilicaris Linné, dont elle diffère par sa forme conique, par ses taches suturales blanches et son ombilic plus étroit"*.

6: following REID (1996) we use *Melarhaphe* for *neritoides* (Linnaeus, 1758), the type and only living member of this genus.

7: BOGI *et al.* (1989) reported a record of this species by TORNARITIS (1987), who has nevertheless not reported it in his work.

8: the origin of *Alvania dorbigny* (Audouin, 1827) is still debated by nowadays Authors: we actually follow the opinion of MIENIS (1985) considering this species as non lessepsian.

9: GIANNUZZI-SAVELLI *et al.* (1997: 15) ascribed this species to the genus *Rudolphosetia* Monterosato, 1917: we follow PONDER (1985: 34) in considering *Rudolphosetia* as a *junior* synonym of *Setia* (H. & A. Adams, 1852).

10: according to ABBOTT (1974: 139) Calyptraeidae de Blainville, 1824 is a junior synonym of Crepulidae Fleming, 1822.

11: *Erronea caurica* (Linnaeus, 1758) reported by GIANNUZZI-SAVELLI *et al.* (1997) has been excluded: see BUZZURRO & GREPPI (1997).

12: BEU (1998) has demonstrated that the Mediterranean form related to *Charonia tritonis* represents a distinct species instead of a subspecies.

13: *Vexillum hypatiae* (Pallary, 1912), reported by CECALUPO & QUADRI (1996) is not listed according to TRINGALI & VILLA (1991).

14: for the claimed synonymy reported by CECALUPO & QUADRI (1996) with *Granulina clandestina* (Brocchi, 1814) see GOFAS (1992).

15: in the past it has been identified by many Authors as *Clathromangelia quadrillum* (Dujardin, 1837), but this is a fossil species (OLIVERIO, 1995).

16: *Mangelia fieldeni* (Aartsen & Fehr de Wal, 1978) = *M. angelinae* (Cecalupo & Quadri, 1996): see BUZZURRO & GREPPI (1997).

17: *Chrysallida decorata* (Philippi, 1849) is the correct name for the taxon commonly reported by several Authors as *Chrysallida maiae* (Hornung & Mermod, 1924) (BUZZURRO & GREPPI, unpublished data).

18: the genus has been assigned following SCHANDER & SUNDBERG (1997).

19: probably the record referred to *Anisocycla nitidissima* (Montagu, 1803).

20: reported by FISCHER (1994) from shallow water of the littoral zone, this is the only record of this deep-sea species, probably it is a case of misidentification with *Caecilianella acicula* Müller, 1774, a terrestrial species commonly found in our samples: see GAGLINI (1982).

21: for the putative finding of *Cylichnina* cf. *mongii* (Audouin, 1827) reported by CECALUPO & QUADRI (1996) see BUZZURRO & GREPPI (1997).

22: the name of this species comes from the Latin word regula(-ae) = a ruler [and not from regulus(-i) = a small king!].

23: for the presence of *Macoma balthica* (Linnaeus, 1758) in the Eastern Mediterranean Sea we refer to BUZZURRO (unpublished data).

24: European Authors traditionally refer *decussatus* to *Tapes*, whereas they currently use *Ruditapes* for the Japanese carpet shell (*R. philippinarum* (Adams & Reeve, 1850), which has been imported for acquaculture since a number of years. Both species

Figs 2-19. Gastropods and bivalves from Cyprus. 2: *Nodilittorina (Echinolittorina) punctata* (Gmelin, 1791) mm 6.6: St. C7. 3: *Rissoa splendida* Eichwald, 1830 mm 4.8: St. C8. 4: *Alvania fractospira* Oberling, 1970 mm 2.5: St. C10. 5: *Alvania testae* (Aradas & Maggiore, 1844) mm 2.1: St. D10. 6: *Hydrobia acuta* (Draparnaud, 1805) mm 3.2: St. C11. 7: *Protatlanta souleyeti* (Smith E. A., 1888) mm 2.1: St. D17. 8: *Cerithiopsis scalaris* Locard, 1892, ex Monterosato ms. mm 4.2: St. C8. 9: *Nassarius circumcictus* (Adams A., 1852) mm 15: St. C10. 10: *Granulina boucheti* Gofas, 1992 mm 2.2: St. C8. 11: *Gymnobela subaraneosa* (Dautzenberg & Fischer H., 1896) mm 5.4: St. D17. 12: *Teretia teres* (Reeve, 1844) mm 4.3: St. D17. 13: *Chrysallida juliae* (de Folin, 1872) mm 1.9: St. C8. 14: *Folinella ghisottii* Aartsen, 1984 mm 2.5: St. C8. 15: *Tragula fenestrata* (Jeffreys, 1848) mm 3.1: St. C8. 16: *Eulimella bogii* Aartsen, 1994 mm 1.9: St. C8. 17: *Turbonilla acutissima* Monterosato, 1884 mm 5.3: St. D21. 18: *Limaria loscombi* (Sowerby G. B. I, 1823) mm 8.9: St. C10. 19: *Kelliella abyssicola* (Forbes, 1844) mm 1.6: St. D16

belong to *Ruditapes*, as proposed by FISCHER-PIETTE & MÉTIVER (1971) and MATSUKUMA (1986); in particular, the last author excludes *Ruditapes* from *Tapes*.
25: *Alvania* sp., under study.

New records of the molluscs fauna of Cyprus

LITTORINIDAE
Nodilittorina (Echinolittorina) punctata (Gmelin, 1791)
(Fig. 2)
Turbo punctatus Gmelin, 1791: 3597
Littorina syriaca Philippi, 1847: 165 (23), pl. 3, figs 21-22
Turbo siculus Chiereghin in NARDO, 1847: 78, sp. 20, figs 909-910
Turbo siculus Brugnone in MONTEROSATO, 1872: 33 (*nomen nudum*)
Littorina punctata, Gmelin in MONTEROSATO, 1872: 33
Littorina (Melaraphe) punctata (Gmelin, 1791) in PRIOLO, 1953: 124
Littorina punctata (Gmelin, 1791) = *Tricolia draparnauldii* Audouin, 1826 =*Littorina pulchella* Dunker, 1853 = *Littorina syriaca* Philippi, 1847 =*Littorina guttata* Reeve, 1858 = *Littorina perplexa* Turton, 1932 in ROSEWATER, 1970: 474
Nodilittorina (Echinolittorina) punctata (Gmelin, 1791) in REID, 1996: 99.
Remarks: The allocation in the genus *Nodilittorina* von Martens, 1897 recently proposed by REID (1996) for this species is surprising because *Nodilittorina*, type species *L. pyramidalis* Quoy & Gaimard, 1833, which is characterised by a strong ribbed sculpture with nodules, includes mainly Indo-pacific species with very different shell. The modern systematics of the family Littorinidae is primarily based on anatomical characters of the penis, pallial oviduct, radula, sperm nurse cells or spawn. See REID (1986, 1989, 1996).
Material: St. C7, C12, 19 specimens, Supralittoral Zone, rocky habitats.
Distribution: Discontinuous distribution in Mediterranean basin, Portugal and African coasts of Atlantic Ocean.

RISSOIDAE
Rissoa splendida *Eichwald, 1830*
(Fig. 3)
Rissoa splendida Eichwald, 1830: 219
Rissoa violaestoma Krynicky, 1837 *fide* CLEMAM
Remarks: *Rissoa splendida* Eichwald, 1830 figured by GIANNUZZI-SAVELLI *et al.*, 1997: 74, figs 203-204.
Material: St. C8, 1 specimen, *Cystoseira* sp., 2-3 m and St. C10, 1 shell, grit near *Posidonia oceanica*, 4 m.
Distribution: Aegean Sea, Central Mediterranean Sea, Adriatic Sea, the Marmara Sea and Black Sea. This species is here reported for the first time from the Levantine Basin.

Alvania fractospira Oberling, 1970
(Fig. 4)
Alvania fractospira Oberling, 1970: 3
Alvania monterosatoi sensu BOGI *et al.*, 1989: 194, fig. 7 (not FISCHER P., 1877)
Remarks: *Alvania fractospira* Oberling, 1970 in MOOLENBEEK *et al.*, 1991: 113, fig. 16 (the lectotype is selected) and in OLIVERIO, 1993: 33 (restored as a valid name) .
Material: St. C1, 3 specimens, *Posidonia oceanica*, 5 m; St. C8, 2 shells in grit near *Posidonia oceanica*, 4 m and St. C10, 2 specimens, *Cystoseira* sp., 1-2 m.
Distribution: Eastern Mediterranean Sea and Adriatic Sea (GIANNUZZI-SAVELLI *et al.*, 1997).

Alvania testae (Aradas & Maggiore, 1844)
(Fig. 5)
Rissoa reticulata Philippi, 1836: 156, tav. 10, fig. 14 (not *T. reticulata* Montagu, 1803)
Rissoa testae Aradas & Maggiore, 1844: 135
Rissoa abyssicola Forbes in FORBES & HANLEY, 1850: 86
Rissoa partschii Hörnes, 1857: 573 (fossil)
Rissoa (Alvania) testae (Aradas & Maggiore, 1844) in ARADAS & BENOIT, 1870a: 199
Rissoa abyssicola var. conformis Jeffreys, 1870: 77
Rissoa (Actonia) testae Aradas & Maggiore in CARUS, 1889: 336
Actonia testae (Aradas & Maggiore, 1844) in MONTEROSATO, 1890: 147
Alvania testae (Aradas & Maggiore, 1844) in LOCARD, 1892: 161
Alvania (Actonia) testae (Aradas & Maggiore) in THIELE, 1931: 163
Turbona testae (Aradas & Maggiore, 1844) in NORDSIECK, 1972: 186
Remarks: *Alvania testae* (Aradas & Maggiore, 1844) in BOUCHET & WARÉN, 1993: 628, figs 1386-1387, 1400-1405 and in OLIVERIO *et al.*, 1992: 251 (*A. testae* complex is here analyzed and discussed).
Material: St. D10 (35°34'8"N-34°28'3"E), 3 shells, muddy habitats, 210 m, dredged.
Distribution: Eastern Mediterranean Sea (Aegean Sea), Western Mediterranean Sea and coastal line of the Eastern Atlantic Ocean from Morocco to Norway.

HYDROBIIDAE
Hydrobia acuta (Draparnaud, 1805)
(Fig. 6)
Cyclostoma acutum Draparnaud, 1805: 40, pl. I, fig. 23
Paludestrina acuta Draparnaud in MONTEROSATO, 1878a: 86
Paludestrina glyca Servain, 1880: 151
Hydrobia acuta (Draparnaud, 1805) in GIUSTI & PEZZOLI (1984: 125, tav. 1)
Remarks: *Hydrobia acuta* (Draparnaud, 1805) figured by GIUSTI *et al.*, 1995: 116, 117, figs 39-42, 50-52. After BOETERS (1984) that designated a lectotype for this species from two syntypes, GIUSTI *et al.* (1998) demonstrated that they to belong to different species and designate a neotype *"in line with the earlier and more widely accepted usage of the name"* (1998: 2, figs 3-6).
Material: St. C11, 5 shells, grit, 1 m.
Distribution: Whole Mediterranean basin (BARASH & DANIN, 1992).
ATLANTIDAE

Protatlanta souleyeti (Smith E. A., 1888)
(Fig. 7)
Atlanta souleyeti Smith E. A., 1888: 1-51, pl. XII, fig. 7a, b
Protatlanta souleyeti (Smith E. A., 1888) = *Atlanta lamanonii* Souleyet, 1852 = *Protatlanta sculpta* Issel, 1911 = *Protatlanta sculpta var. mediterranea* Issel, 1911 = *Protatlanta mediterranea* (Issel) Di Geronimo, 1970 in VATOVA, 1975: 1
Remarks: *Protatlanta souleyeti* (Smith E. A., 1888) figured by GIANNUZZI-SAVELLI *et al.*, 1997: 248, figs 921-923.
Material: St. D17 (35°43'8"N-34°37'3"E), 1 shell, 250-300 m dredged.
Distribution: It has a cosmopolitan distribution due to its pelagic life style, similar to other members of the family. Southern Aegean Sea, Central Mediterranean and Western Mediterranean Sea. It is here reported for the first time in the Levantine basin.

CERITHIOPSIDAE
Cerithiopsis scalaris Locard, 1892, ex Monterosato ms.
(Fig. 8)
Cerithiopsis scalaris Monterosato, 1878a = *C. corona var. scalaris* Monterosato: 99 (*nomen nudum*)
Cerithiopsis scalaris Monterosato, 1878 in LOCARD, 1892: 118
Cerithiopsis scalaris Coen, 1937: 31, tav. 3, fig. 26 (*nomen nudum*)
Cerithiopsis scalaris (Monterosato, 1877) in NORDSIECK, 1976: 7; 6, fig. 10
Cerithiopsis scalaris Monterosato, 1877 in PIANI, 1980: 136
Cerithiopsis scalaris Monterosato, 1878 (*nomen nudum*) in GAGLINI, 1992: 148, fig. 139
Cerithiopsis scalaris Locard, 1892, ex Monterosato ms. in TRINGALI, 1999: 129, 130: figs 1-3
Remarks: *Cerithiopsis scalaris* Locard, 1892 figured by GIANNUZZI-SAVELLI *et al.*, 1999: 41, figs 60- 63.
Material: St. C8, 2 shells, grit near *Posidonia oceanica*, 4 m.
Distribution: Central Mediterranean Sea. It is here reported from the Eastern Mediterranean Sea for the first time.

NASSARIIDAE
Nassarius circumcictus (Adams A., 1852)
(Fig. 9)
Nassa circumcincta Adams A., 1852: 102.
Arcularia circumcincta Adams A. in PALLARY, 1912: 96, pl.XV (I), figg. 14-17
Nassarius (Plicarcularia) circumcictus (A. Adams, 1851) in PIANI, 1980: 149
Nassarius (Plicarcularia) circumcictus (Adams A., 1852) = *Naytiopsis granum flammulata* Nordsieck, 1972 in NOFRONI, 1986: 13
Remarks: *Arcularia circumcincta* (Adams A., 1851) in SABELLI & SPADA, 1977: 3, figs 5a-5b and *Nassarius circumcictus* (Adams A., 1851) in OLIVERIO & TRINGALI, 1992: 159, figs 4-8.
Material: St. C10, 2 specimens, sandy habitat, 2 m.
Distribution: Eastern Mediterranean Sea.

CYSTISCIDAE
Granulina boucheti Gofas, 1992
(Fig. 10)
Granulina boucheti Gofas, 1992: 10, fig. 9; 11, fig. 10; 24, fig. 26.
Material: St. C8, 2 specimens, alive collected in brown algae, 1 m.
Distribution: Sicily, France, Corse, Tunisie and Algerie. It is here reported from the Levantine basin for the first time.

CONIDAE
Gymnobela subaraneosa (Dautzenberg & Fischer H., 1896)
(Fig. 11)
Pleurotoma subaraneosa Dautzenberg & Fischer H., 1896: 422, pl. 16, figs 11-12
Gymnobela subaraneosa (Dautzenberg & Fischer H., 1896) in BOUCHET & WARÉN, 1980: 58, figs 114-115
Pleurotomella subaraneosa (Dautzenberg & Fischer H., 1896) in POWELL, 1966: 131.
Material: St. D17 (35°43'8"N-34°37'3"E), 1 shell, muddy bottoms, 250-300 m, dredged.
Distribution: Mediterranean Sea and North Eastern Atlantic Ocean. Reported once from the Eastern Mediterranean Sea (JANSSEN, 1989).

Teretia teres (Reeve, 1844)
(Fig. 12)
Pleurotoma teres Reeve, 1844: 190
Philbertia anceps (Eichwald, 1830) (fossil): 225
Pleurotoma boreale Phil., ms. in LOVÉN, 1846: 14
Pleurotoma fusiforme Réquien, 1848: 101
Pleurotoma anceps in LOCARD, 1866: 109
Raphitoma barbierii Brusina, 1866: 33
Pleurotoma teres Forbes in MONTEROSATO, 1870: 45
Defrancia (Pleurotoma) teres Forbes in MONTEROSATO, 1872: 51
Pleurotoma (Defrancia) anceps Eichwald in MONTEROSATO, 1875: 44
Clathurella anceps V. Crs. in CARUS, 1889: 427
Teretia teres Forbes in MONTEROSATO, 1890: 187
Teretia anceps (Eichwald, 1830) in PIANI, 1980: 157
Teretia teres (Reeve, 1844) in SABELLI *et al.*, 1990: 45
Remarks: *Teretia teres* (Forbes, 1844) figured by BOUCHET & WARÉN, 1980: 81, fig. 168 and GIRIBET & PEÑAS, 1997: 75, fig. 69.
Material: St. D17 (35°43'8"N-34°37'3"E), 1 shell, muddy bottoms, 250-300 m, dredged.
Distribution: Coastline from Gibraltar Strait to Northern Norway, Western Mediterranean Sea, Adriatic Sea and Aegean Sea. It is here reported from the Levantine basin for the first time.

PYRAMIDELLIDAE
Chrysallida juliae (de Folin, 1872)
(Fig. 13)
Truncatella juliae de Folin, 1872: 49, pl. II, fig. 4
Odostomia (Pyrgulina) nanodea Monterosato, 1878a: 93
Parthenina tenuistriata Milachewitch, 1909: 314
Chrysallida sarsi Nordsieck, 1972: 98, pl. II, fig. 4 in PEÑAS *et al.*, 1996: 24
Chrysallida juliae (de Folin, 1872) in AARTSEN, 1977: 61, fig. 13.
Remarks: *Chrysallida juliae* (de Folin, 1872) in MICALI *et al.* (1993: 150): it is there designated the lectotype. Regarding all

the synonyms listed above we are waiting for the revision of these taxa accomplished by I. Nofroni (personal communication, manuscript in preparation).
Material: St. C8, 3 shells, grit near *Posidonia oceanica*, 4 m.
Distribution: Mediterranean Sea and Atlantic Ocean including the Canary Islands.

Folinella ghisottii Aartsen, 1984
(Fig. 14)
Odostomia intermedia Brusina, 1869: 237 (non Deshayes, 1861)
Odostomia (Pyrgulina) intermedia Brusina in MONTEROSATO, 1878b: 317
Folinella ghisottii Aartsen, 1984: 137.
Material: St. C8, 1 shell, grit near *Posidonia oceanica*, 4 m.
Distribution: Mediterranean Sea and Atlantic Ocean including the Cape Verde Islands.

Tragula fenestrata (Jeffreys, 1848)
(Fig. 15)
Odostomia fenestrata Jeffreys, 1848: 345, pl. 6, fig. 17
Chemnitzia fenestrata Jeffreys in FORBES & HANLEY, 1853: 249
Odostomia (Pyrgulina) fenestrata, Forbes in MONTEROSATO, 1877: 35
Tragula fenestrata (Jeffreys, 1848) in MONTEROSATO, 1884: 86
Odostomia (Tragula) fenestrata Forbes in PALLARY, 1912: 132, pl. XVI (II), fig. 42
Turbonilla fenestrata (Forbes) in BABIO & THIRIOT-QUIEVREUX, 1974: 544, pl. VI, H, L
Tragula fenestrata (Forbes, 1848) in GROSSU, 1986: 24
Chrysallida fenestrata (Forbes in Jeffreys, 1848) in AARTSEN, 1981: 80, pl. 1, fig. 1
Chrysallida fenestrata (Jeffreys, 1848) in LINDEN & EIKENBOOM, 1992: 45
Remarks: *C. fenestrata* (Jeffreys, 1848) figured by PEÑAS *et al.*, 1996: 27, fig. 54.
Material: St. C8, 1 shell, grit near *Posidonia oceanica*, 4 m.
Distribution: Mediterranean Sea and Atlantic Ocean including Corimba.

Eulimella bogii Aartsen, 1994
(Fig. 16)
Eulimella bogii Aartsen, 1994: 89-90, fig. 5.
Material: St. C8, 1 shell, near *Posidonia oceanica*, 4 m.
Distribution: Mediterranean Sea including the Eastern basin (NOFRONI & TRINGALI, 1995).

Turbonilla acutissima Monterosato, 1884
(Fig. 17)
Turbonilla acutissima Monterosato, 1884: 92
Remarks: *Turbonilla acutissima* Monterosato, 1884 figured by AARTSEN, 1981: 85, pl. 4, fig. 24 and PEÑAS *et al.*, 1996: 69, fig. 185.
Material: St. D21(35°09'0"N-33°57'0"E), 1 shell, *Posidonia oceanica*, 20 m, dredge.
Distribution: Mediterranean Sea (POPPE & GOTO, 1990).

LIMIDAE
Limaria loscombi (Sowerby G. B. I, 1823)
(Fig. 18)
Lima loscombi Sowerby G. B. I, 1823: 17, pl. 113, fig. 4
Limea loscombei Sowerby in ARADAS & BENOIT, 1870b: 94
Lima (Limatella) loscombei Leach in Sowerby in ANDERSON, 1964: 144, figs 27a-c
Lima (Limea) loscombii Sowerby G. B., 1823 in ALTENA REGTEREN *et al.*, 1969: 24 (fossil)
Lima (Mantellum) loscombi Sowerby = *Lima bullata* Turton = *Lima clausa* Danilo & Sandri in MUSETTI, 1969: 52
Limaria (Limatulella) loscombi (Sowerby G. B., 1830) in JANSSEN, 1972: 16, 74, figs 4-5 (fossil)
Limea (Limea) loscombi MacGillivray, 1843 in PIANI, 1980: 187
Limea loscombi (Sowerby G. B. I, 1823) in SABELLI *et al.*, 1990: 85
Limea (Limatulella) loscombi (Sowerby G. B. I, 1823) in ZENETOS, 1996: 88
Limaria loscombii (Sowerby G. B. I, 1823) in SALAS, 1996: 57.
Material: St. C10, 1 specimen, muddy–sandy habitats, 1.5 - 2 m.
Distribution: This species is common in muddy and muddy-sandy bottoms down to a depth of 3000 m (PARENZAN, 1974), distributed in the Aegean Sea, Adriatic Sea, Western Mediterranean Sea and the coastline of the Eastern Atlantic Ocean from Senegal and to Norway (JEFFREYS, 1879; TEBBLE, 1976; BARASH & DANIN, 1992).

KELLIELLIDAE
Kelliella abyssicola (Forbes, 1844)
(Fig. 19)
Kellia abyssicola Forbes, 1844: 122
Venus miliaris Philippi, 1844: 36, pl. 14, fig. 15
Kelliella abyssicola Sars in MONTEROSATO, 1870: 39
Kelliella miliaris Philippi in SARS, 1878: 65
Kelliella miliaris Philippi in MONTEROSATO, 1880: 59
Kellyella miliaris (Phil.) in PARENZAN, 1974: 154, 265, fig. 158
Kelliella abyssicola (Forbes, 1844) in SABELLI *et al.*, 1990: 95.
Material: St. D16 (35°19'9"N-32°50'1"E), 1 specimen, muddy habitats, 210 m, dredged.
Distribution: Aegean Sea, Taranto Gulf and Northern Norway coasts (PARENZAN, 1974; POPPE & GOTO, 1993; ZENETOS, 1996). Already reported from the Eastern Mediterranean Sea by JANSSEN (1989). This species shows a vertical distribution from the continental shelf down to the abyssal zone.

DISCUSSION

There has been a significant increase in the number of molluscan species reported from Cyprus since the first study carried out by MONTEROSATO (1899). In fact, in his report, an initial amount of 29 species was listed. But the number has grown up to 696 to date. Particularly, the studies of BOGI *et al.* (1989), FISCHER (1994), CECALUPO & QUADRI (1996) and BUZZURRO & GREPPI (1997) made important contribution to such increase. BOGI *et al.* (1989), reported 221 species in total, 89 as new records from this island. Then, FISCHER (1994) gave

a list of 123 fossils and 434 living species for Cyprus. This Author, following SABELLI *et al.* (1990-1992), has reconsidered the systematic positions of several species reported by DEMETROPOULOS (1969, 1971), DEMETROPOULOS & HADJICHRISTOPHOROU (1976), STAVRINOS (1984) and TORNARITIS (1987). Since there are many different views concerning classification, at the mean time FISCHER (1994) followed his personal conception regarding some cases of synonymy, changing the taxonomical rank of some species. For example, while *Emarginula cancellata* Philippi, 1836 and *Emarginula sicula* Gray J. E., 1825 are two synonyms according to SABELLI *et al.* (1990), on the contrary FISCHER (1994: 87) reported these two *taxa* as distinct species. In our opinion the sole valid species name is *E. sicula*. Other controversial cases of synonymy that we had to face making the new checklist are discussed below. BOGI *et al.* (1989) reported *Pirenella conica* (Blainville, 1826) and *Pirenella cailliaudi* (Potiez & Michaud, 1838) as different species, while the latter should be considered just as junior synonym of the first one according to SABELLI *et al.* (1990-1992). In like manner, *Lima lima* (Linnaeus, 1758) and *Lima inflata* (Chemnitz, 1784) should be thought as synonyms, taking as valid species name *L. lima*. Similarly, MICALI *et al.* (1993) considered *Chrysallida* cf. *delpretei* (Sulliotti, 1889) as junior synonym of *Chrysallyda indistincta* (Montagu, 1808): both *taxa* are listed as separate species in BOGI *et al.* (1989). An another example of systematic confusion is the case of *Retusa semisulcata* (Philippi, 1836) and *Retusa truncatula* (Brugière, 1792), both listed in CECALUPO & QUADRI (1996), but re-discussed as synonyms by TRINGALI (1995).

Of a total of 389 species listed by CECALUPO & QUADRI (1996), 134 species were new ones for Cyprus. In their papers, BUZZURRO & GREPPI (1997) and SALMAN *et al.* (1998) have reported 42 and 10 additional new species, respectively, for the Cyprus coasts. When the lists of BOGI *et al.* (1989) and CECALUPO & QUADRI (1996) are compared, 6 and 24 species, respectively, given as new records had already been reported previously (Table 4). Additionally, *Argonauta argo* Linnaeus, 1758 reported by SALMAN *et al.* (1998) as a new record, was

Table 4. *Species previously listed by* BOGI *et al. (1989) (*) and* CECALUPO *&* QUADRI *(1996) (**) as new records and the literature relevant to these species.*

Species	Literature giving former records
Ischnochiton rissoi (Payraudeau, 1826) *	BARASH & DANIN (1977: 7)
Lepidochitona corrugata (Reeve, 1848) *	BARASH & DANIN (1977: 9)
Chiton corallinus (Risso, 1826)**	BARASH & DANIN (1977: 12)
Gibbula umbilicaris (Linnaeus, 1758)**	FISCHER (1993A: 38)
Cerithium scabridum Philippi, 1848 **	FISCHER (1993A: 39)
Rissoa auriformis pseudomonodonta (Verduin, 1983)**	AARTSEN & KINZELBACH (1990: 109)
Alvania datchaensis Amati & Oliverio, 1987 **	AARTSEN & KINZELBACH (1990: 109)
Alvania mamillata Risso, 1826 **	VERDUIN (1986: 30)
Alvania beniamina (Monterosato, 1884) **	VERDUIN (1984: 49)
Strombus persicus Swainson, 1821 **	FISCHER (1993A: 39)
Petaloconchus glomeratus (Linnaeus, 1758) **	STAVRINOS (1984: 21)
Vitreolina levantina Oliverio, Buzzurro & Villa, 1994 **	OLIVERIO *et al.* (1994: 214)
Vexillum littorale (Forbes, 1844) *	TORNARITIS (1987: 103)
Bela laevigata (Philippi, 1836) **	FISCHER (1993A: 40)
Bela menkhorsti Aartsen, 1988 **	FISCHER (1993A: 40)
Bela nebula (Montagu, 1803) *	DEMETROPOULOS (1971: 20)
Mitrolumna olivoidea (Cantraine, 1835)*	DEMETROPOULOS (1971: 16)
Chrysallida terebellum (Philippi, 1844)**	LINDEN & EIKENBOOM (1992: 18)
Turbonilla delicata (Monterosato, 1874) **	BARASH & DANIN (1989: 248)
Turbonilla striatula (Linnaeus, 1758)**	BARASH & DANIN (1989: 248)
Retusa mamillata (Philippi, 1836) **	FISCHER (1993A: 40)
Retusa semisulcata (Philippi, 1836) **	FISCHER (1993A: 40)
Cylichnina umbilicata (Montagu, 1803) *	DEMETROPOULOS (1969: 13)
Cylichna crossei (B.D.D., 1886) **	BARASH & DANIN (1989: 250)
Cavolinia tridentata (Niebuhr, 1775 ex Forskäl, ms.) **	TORNARITIS (1987: 114)
Styliola subula (Quoy & Gaimard, 1827) **	BARASH & DANIN (1989: 253)
Modiolarca subpicta (Cantraine, 1835)*	DEMETROPOULOS & HADJICHRISTOPHOROU (1971: 79)
Lucinella divaricata (Linnaeus, 1758) **	FISCHER (1994: 93)
Cerastoderma edule (Linnaeus, 1758) **	DEMETROPOULOS (1971: 21)
Abra nitida (Müller O. F., 1776) **	FISCHER (1994: 93)
Gastrochaena dubia (Pennant, 1777) **	FISCHER (1994: 93)

previously reported by DEMETROPOULOS (1969). Besides that, *Anachis troglodytes* (Souverbie & Montrouzier, 1866) and *Anachis savignyi* Moazzo, 1939 ex Jousseaume ms. reported as synonyms by CECALUPO & QUADRI (1996), are considered as two distinct species according to TRINGALI & VILLA (1995).
Furthermore, although CECALUPO & QUADRI (1996) discussed that some of the species which had been reported as synonyms by SABELLI *et al.* (1990) can be accepted as valid *taxa*, species such as *Emarginula crebrisculpta* (Coen, 1939), *Calliostoma alexandrinum* Pallary, 1911, *Muricopsis inermis* (Philippi, 1836), *Mangelia derelicta* Reeve, 1846, *Raphitoma intermedia* Nordsieck, 1977 and *Raphitoma lineolata* (B.D.D., 1883) are not valid species according to the CLEMAM database.
Some of the species names found in literature referred to the Island of Cyprus have been omitted from the checklist because fossils: *Alvania monterosatoi* (Fischer P., 1876), *Granulina clandestina* (Brocchi, 1814), *Clathromangelia quadrillum* (Dujardin, 1837), *Raphitoma histrix* Bellardi, 1847, *Odostomia bismichaelis* Sacco, 1892 and *Odostomia* cf. *clavulina* Fischer P., 1877. Also *Hydrobia ulvae* (Pennant, 1777), most probably confused with other *Hydrobia* sp., has been deleted since we reasonably think it is not a Mediterranean species. Other cases of shell misidentification reported by TORNARITIS (1987) are: *Cerithiopsis tubercularis* (Montagu, 1803) which is *Dizoniopsis coppolae* (Aradas, 1870) (: 58, fig. 80b), *Fusinus pulchellus* (Philippi, 1844) is just a juvenile form of *F. syracusanus* (Linnaeus, 1758) (: 98, fig. 146), *Mathilda cochlaeformis* Brugnone, 1873 which is *M. gemmulata* Semper, 1865 (:54, fig. 72); *Mytilus edulis* Linnaeus, 1758 which is *M. galloprovincialis* Lamarck, 1819, since the former is not an eastern mediterranean species. *Hinnites distorta*, to allocate within the genus *Crassadoma* according to WALLER (1993), has been reported only once by DEMETROPOULOS (1971), most probably it has been misidentified with *C. multistriata*. We remove this *taxon* from the proposed checklist of molluscs of Cyprus, since this species is mainly distributed in the Atlantic Ocean and very seldom reported from the Western Mediterranean basin. FISCHER (1994) has reported over 90 Indo-Pacific species in the Levantine basin, and 8 of them have also been recorded from the Cyprus coasts. Today, the number of the known Indo-Pacific species occurring in the Island of Cyprus increased up to 32 (Table 3). Summing up all the data coming from this investigation and those of the past, a total of 696 Molluscs species are presently known from Cyprus.

ACKNOWLEDGEMENTS

Sincere thanks are due to: Dr. P. Mariottini (Università di Roma Tre, Roma, Italy) for critical reading of the manuscript, Dr. J. M. Poutiers (MNHN) for helpful suggestions, Dr. V. Aysel (University of Canakkale, Turkey) for identifying the sampled algae, Dr. R. La Perna (Università di Bari, Italy) for helpful advises on Bivalvia Systematics, Dr. M. Bodon (Università di Siena, Italy), Dr. S. Chiarelli (Porto Garibaldi, Italy), Dr. S. Gofas (University of Malaga, Spain), Dr. A. W. Janssen (Gozo, Malta), Dr. G. Manganelli (Università di Siena, Italy), Dr. H. Mienis (University of Jerusalem, Israel), Mr. G. Nardi (Ghedi, Italy), Dr. M. Oliverio (Università "La Sapienza", Roma, Italy), Mr. P. Russo (Venezia, Italy), Dr. M. Streitz (Valbonne, France) and Dr. A. Zenetos (National Centre for Marine Research, Hellenikon, Greece) for generously providing references. We are very indebted to Mr. A. Cecalupo (Buccinasco, Italy) for his cooperation in dealing with the many synonyms treated in the present paper and in supplying references. We are really grateful to Dr. J. J. Van Aartsen (Dieren, The Netherland) and Dr. P. Micali (Fano, Italy) for *G. subaraneosa* and *T. acutissima* identification, respectively. We are deeply indebted to Dr. S. Chiarelli (Porto Garibaldi, Italy) and Dr. E. Greppi (Castellanza, Italy) for having taken the pictures utilized in the present paper.

REFERENCES

AARTSEN J. J. VAN, 1977. European Pyramidellidae: I *Chrysallida*. *Conchiglie*, Milano, 13 (3-4): 49-64.

AARTSEN J. J. VAN, 1981. European Pyramidellidae: II *Turbonilla*. *Bollettino Malacologico*, Milano, 17 (5-6): 61-88.

AARTSEN J. J. VAN, 1984. The Pyramidellid-Genera described by the Marquis L. de Folin. *Bollettino Malacologico*, Milano, 20 (5-8): 131-138.

AARTSEN J. J. VAN, 1994. European Pyramidellidae: IV. The genera *Eulimella*, *Anisocycla*, *Syrnola*, *Cingulina*, *Oscilla* and *Careliopsis*. *Bollettino Malacologico*, Milano, 30 (5-9): 85-110.

AARTSEN J. J. VAN & KINZELBACH R., 1990. Marine molluscs from Iztuzu beach near Dalyan (Mediterranean coast of Turkey). *Zoology in the Middle East*, 4: 103-112.

ADAMS A., 1852. Catalogue of the species of *Nassa*, a genus of Gasteropodous Mollusca, belonging to the family Buccinidae, in the Collection of Hugh Cuming, Esq., with the description of some new species. *Proceedings of the Zoological Society of London*, 109: 94-112.

ABBOTT R. T., 1974. *American Seashells. The Marine Mollusca of the Atlantic and Pacific Coasts of North America.* Second Edition. Van Nostrand Reinholdt, New York, 633 pp., pl. 24.

ALTENA REGTEREN C. O. VAN, BLOKLANDER A., POUDEROYEN L. P. & SLIK L. VAN DER, 1969. De fossiele schelpen van de Nederlandse stranden en zeegaten tweede serie, 3. *Basteria*, 33 (1-4): 11-29.

ANDERSON H. J., 1964. Die miocäne Reinbek-Stufe in Nord- und Westdeutschland und ihre Mollusken-Fauna. *Fortschr. Geol. Rheinld. Westf.*, 14: 31-368, pl. 52.

ARADAS A. & BENOIT L., 1870a. *Conchigliologia vivente marina della Sicilia e delle isole che la circondano.* Stabilimento tipografico di C. Galatola, Catania, 324 pp., pl. I-V

ARADAS A. & BENOIT L., 1870b. Conchigliologia vivente marina della Sicilia e delle isole che la circondano. *Atti dell'Accademia Gioenia di Scienze Naturali in Catania*, 6 (3): 1-113, pl. 1-2.

ARADAS A. & MAGGIORE G., 1844. Catalogo ragionato delle conchiglie viventi e fossili di Sicilia. *Atti dell'Accademia Gioenia di Scienze Naturali in Catania*, 20: 101-142.

BABIO C. R. & THIRIOT-QUIEVREUX C., 1974. Gastéropodes de la région de Roscoff. Etude particulière de la protoconque. *Cahiers de Biologie Marine*, Tome XV, 531-549, pl. I-V.

BARASH A. & DANIN Z., 1977. Polyplacophora (Mollusca) from the Eastern Mediterranean. *Journal de Conchyliologie*, 114 (1-2): 3-28.

BARASH A. & Danin Z., 1989. Contribution to the knowledge of Opisthobranchia of Cyprus. *Bollettino Malacologico*, Milano, [1988], 24 (9-12): 243-260.

BARASH A. & DANIN Z., 1992. Mollusca I - Annotated list of Mediterranean molluscs of Israel and Sinai. *The Israel Academy of Sciences and Humanities*, Jerusalem, 405 pp.

BARASH A. & LEWINSOHN C., 1971, in ARON W. & POR F. D. *Report on the third Cyprus Expedition,* 1970. The Hebrew University – Smithsonian Institution Joint Project "Biota of the Red Sea and the Eastern Mediterranean". Appendix to Progress Report 1970/1971: 1-2.

BEU A. G., 1998. Résultats des Campagnes MUSORSTOM, Volume 19. Indo-West Pacific Ranellidae, Bursidae and Personidae (Mollusca: Gastropoda). A Monograph of the New Caledonian fauna and revision of related taxa. *Mémoires du Muséum national d'Histoire naturelle*, Paris, **178**: 1-255 pp.

BOGI C., CIANFANELLI S. & TALENTI E., 1989. La Malacofauna dell'Isola di Cipro. *Atti Prima Giornata di Studi Malacologici C.I.S.MA*, Roma, [1988], 187-214.

BOETERS H. D., 1984. Zur Identitat des *Hydrobia*-Typus (Prosobranchia: Hydrobiidae). *Heldia*, **1**: 3-5.

BOUCHET P. & WARÉN A., 1980. Revision of the North-East Atlantic bathyal and abyssal Turridae (Mollusca, Gastropoda). *Journal of Molluscan Studies*, London, Suppl. **8**: 119 pp.

BOUCHET P. & WARÉN A., 1993. Revision of the Northeast Atlantic bathyal and abyssal Mesogastropoda. *Bollettino Malacologico*, Milano, Suppl. **3**: 579-840.

BRUSINA S., 1866. Contribuzione pella fauna dei molluschi dalmati. *Verhandlungen der Kaiserlich-königlichen zoologisch-botanischen Gesellschaft in Wien*, **16**: 1-134.

BRUSINA S., 1869. Gastéropodes nouveaux de l'Adriatique. *Journal de Conchyliologie*, Paris, **17**: 230-249.

BUZZURRO G., 2002. A new species of *Odostomia* s.l. (Gastropoda, Heterobranchia, Pyramidellidae) from Cyprus. *La Conchiglia*, Roma, 2001, **33**. (301): 14-16,59.

BUZZURRO G. & GREPPI E., 1997. Note e considerazioni sui molluschi di Cipro con particolare riguardo alle specie alloctone. *La Conchiglia*, Roma, **29** (283): 21-31, 61-62.

CARUS J. V., 1889. *Prodromus faunae mediterraneae sive descriptio animalium maris mediterranei incolarum.* Stuttgart, 2, 854 pp.

CECALUPO A. & QUADRI P., 1994. Contributo alla conoscenza malacologica per il Nord dell'Isola di Cipro (Parte I). *Bollettino Malacologico*, Milano, **30** (1-4): 5-16.

CECALUPO A. & QUADRI P., 1995. Contributo alla conoscenza malacologica per il Nord dell'Isola di Cipro (Parte II). *Bollettino Malacologico*, Milano, **30** (9-12): 269-276.

CECALUPO A. & QUADRI P., 1996. Contributo alla conoscenza malacologica per il Nord dell'Isola di Cipro (Terza e ultima parte). *Bollettino Malacologico*, Milano, **31** (5-8): 95-118.

CLEMAM. Unitas Malacologica Check List of European Marine Mollusca. Internet site [current URL http://www.mnhn.fr/base/malaco.html]. Réalisé par J. LE RENARD, B.I.M.M., M.N.H.N. Paris.

COEN G., 1937. Nuovo saggio di una Sylloge Molluscorum Adriaticorum. *Comitato Talassografico Italiano Memoria*, Venezia. CCXL, 173 pp.

DAUTZENBERG P. & FISCHER H., 1896. Dragages effectués par l'*Hirondelle* et par la *Princesse-Alice*. 1. Mollusques Gastéropodes. *Mémoires de la Société Zoologique de France*, **9**: 395-498.

DELL'ANGELO B. & SMRIGLIO C., 1999. *Chitoni viventi del Mediterraneo.* Edizioni Evolver Srl, Roma, 255 pp.

DEMETROPOULOS A., 1969. Marine molluscs of Cyprus. Part A (Placophora, Gastropoda, Scaphopoda, Cephalopoda). *Fisheries Bulletin*, Ministry of Agriculture and Natural Resources, Fisheries Department, **2**: 1-15.

DEMETROPOULOS A., 1971. Marine molluscs of Cyprus. Part B. Bivalvia (Lamellibranchiata). *Fisheries Bulletin*, Ministry of Agriculture and Natural Resources, Fisheries Department, **3**: 1-24.

DEMETROPOULOS A. & HADJICHRISTOPHOROU M., 1976. Some additions to the knowledge of the Malacofauna of Cyprus. *Fisheries Bulletin*, Ministry of Agriculture and Natural Resources, Fisheries Department, **4**: 75-83.

DRAPARNAUD J. P. R., 1805. *Histoire naturelle des mollusques terrestres et fluviatiles de la France.* D. Colas Imprimeur-Libraire. Paris, 116 pp., 13 pl.

EICHWALD E., 1830. *Naturhistorische Skizze von Lithauen, Volhynien und Podolien in geognostic-mineralogischer, botanischer und zoologischer Hinsicht.* Wilna, 256 pp, 3 pl.

FISCHER W., 1993a. Beiträge zur kenntnis der rezenten und fossilen marinen Molluskenfauna Zyperns (I). Die Mollusken der Khrysokhou Bucht, sowie ein kleiner Beitrag zu den rezenten Foraminiferen. *Club Conchylia Information*, **15** (1): 37-46.

FISCHER W., 1993b. Beiträge zur kenntnis der rezenten und fossilen marinen Molluskenfauna Zyperns (II). Die Mollusken der Kap Drepanum (Peyia, Paphos). *Club Conchylia Information*, **15** (2): 147-152.

FISCHER W., 1994. Beiträge zur kenntnis der rezenten und fossilen marinen Molluskenfauna Zyperns (III). Aktualisierte Liste der rezenten und pleistozänen marinen Mollusken Zyperns. *Club Conchylia Information*, **16** (1): 86-96.

FISHER-PIETTE E. & METIVER B., 1971. Révision des Tapetinae (Mollusques Bivalves). *Mémoires du Muséum national d'Histoire naturelle*, Paris, (A) 71: 1-106 pp., pl. 16.

FOLIN L. DE, 1872. Espèces animales inédites du Golfe de Gascogne. *Les Fonds de la Mer*. Paris, **2**: 45-50.

FORBES E., 1844. Report on the Mollusca and Radiata of the Aegean Sea, and on their distribution, considered as bearing on geology. *Reports of the British Association for the Advancement of Science for 1843*: 10-193.

FORBES E. & HANLEY S., 1850. *A history of British Mollusca and their shells. 3* (1). J. Van Voorst, London, 320 pp.

FORBES E. & HANLEY S., 1853. *A history of British Mollusca and their shells, including the families of Gasteropoda from Neritidae to Elysiadae. 3*. J. Van Voorst, London, 616 pp.

GAGLINI A., 1982. Melanellidi del Mediterraneo: i generi *Strombiformis* e *Haliella* in particolare. *Notiziario C.I.S.Ma*, Roma, [1981], **3** (1-2): 45-54.

GAGLINI A., 1992. Terze spigolature... monterosatiane. *Argonauta*, Roma, [1991], 7 (1-6): 125-180.

GEIGER D. L., 1998. Recent Genera and Species of the Family Haliotidae Rafinesque, 1815 (Gastropoda: Vetigastropoda). *Nautilus*, **111** (3): 85-116.

GIANNUZZI-SAVELLI R., PUSATERI F., PALMIERI A. & EBREO C., 1997. *Atlante delle conchiglie marine del Mediterraneo. Vol. 2 (Caenogastropoda parte 1: Discopoda-Heteropoda).* Edizioni "La Conchiglia", Roma, [1996], 258 pp.

GIANNUZZI-SAVELLI R., PUSATERI F., PALMIERI A. & EBREO C., 1999. *Atlante delle conchiglie marine del Mediterraneo. Vol. 3 (Caenogastropoda parte 2: Ptenoglossa).* Edizioni Evolver Srl, Roma, 127 pp.

GIRIBET G. & PEÑAS A., 1997. Fauna malacológica del litoral del Garraf (NE de la Península Ibérica). *Iberus*, **15** (1): 41-93.

GIUSTI F. & PEZZOLI E., 1984. Notulae malacologicae, XXIX – Gli Hydrobiidae salmastri delle acque costiere italiane: primi cenni sulla sistematica del gruppo e sui caratteri distintivi delle singole morfologie. *Lavori S.I.M.*, Atti Simposio di Bologna, [1982], 21: 117-148.

GIUSTI F., MANGANELLI G. & BODON M., 1998. A proposed neotype for *Hydro-*

bia acuta (Draparnaud, 1805). *Journal of Conchology*, **36** (3): 1-8.

GIUSTI F., MANGANELLI G. & SCHEMBRI P. J., 1995. *The non-marine molluscs of the Maltese Islands.* Monografie XV. Museo Regionale di Scienze Naturali Torino, 607 pp.

GMELIN J. F., 1791. *Carli Linnaei systema naturae per regna tria naturae.* Editio decimatertia, aucta, reformata, Vermes Testacea Leipzig, 1 (6): 3021-3910.

GOFAS S., 1992. Le gênre *Granulina* (Marginellidae) en Mediterranée et dans l'Atlantique oriental. *Bollettino Malacologico*, Milano, **28** (1-4): 1-26.

GROSSU A. V., 1986. Révision de la famille des Pyramidellidae sur les côtes Roumaine de la mer Noire et description d'une nouvelle espèce (Order Entomotaeniata, Prosobranchia). *Apex*, 1 (1): 19-26.

HADJICHRISTOPHOROU M., ARGYROU M., DEMETROPOULOS A. & BIANCHI T. S., 1997. A species list of the sublittoral soft-bottom macrobenthos of Cyprus. *Acta Adriatica*, **38** (1): 3-32.

HÖRNES E., 1857. Die Fossilen Mollusken des Tertiaer-Beckens von Wien. Wien, 756 pp.

HOUART R., 2001. *A review of the recent Mediterranean and Northeaster Atlantic species of Muricidae.* Edizioni Evolver, Roma, 227 pp.

JANSSEN A. W., 1972. Die Mollusken-Fauna der Twistringer Schichten (Miocän) von Norddeutschland. *Scripta Geologica*, Leiden, **10**: 1-95, pl. 11.

JANSSEN R., 1989. Benthos-Mollusken aus dem Tiefwasser des östlichen Mittelmeeres, gesammelt während der "METEOR"-Fahrt 5 (1987). *Senckenbergiana marit.*, Frankfurt am Main, **20** (5-6): 265-276.

JEFFREYS J. G., 1848. On the recent species of *Odostomia*, a genus of gasteropodous mollusks inhabiting the seas of Great Britain and Ireland. *Annals and Magazine of Natural History,* 2 (2): 330-351.

JEFFREYS J. G., 1870. Mediterranean Mollusca. *Annals and Magazine of Natural History,* 4 (6): 65-86.

JEFFREYS J. G., 1879. On the Mollusca procured during the "Lightning" and "Porcupine" Expediotions, 1868-70. Part II. *Proceeding of the Zoological Society of London*, **17**: 29-64.

LINDEN J. VAN DER & EIKENBOOM J. C. A., 1992. On the taxonomy of the recent species of the genus *Chrysallida* Carpenter from Europe, the Canary Islands and the Azores. *Basteria*, **56**: 3-64.

LOCARD A., 1886. *Prodrome de Malacologie française. Catalogue général des Mollusques vivants de France. Mollusques marins.* Lyon, H. Georg and Paris, Baillère, 779 pp.

LOCARD A., 1892. *Les coquilles marines des côtes de France. Description des Familles, Gênres et Espèces.* Librairie J. B. Baillière & Fils, Paris, 384 pp.

LOVÉN S., 1846. *Index molluscorum litora Scandinaviae occidentalia habitantium.* P.A. Norstedt et Filii, Holmiae, 50 pp. (reprint)

MATSUKUMA A., 1986. Studies on the Kawamura Collection (Mollusca) in the National Science Museum, Tokyo. Genus *Tapes* Megerle, 1811 (Bivalvia), with Description of a New Species. *Venus*, **45** (1): 11-30.

MICALI P., NOFRONI I. & AARTSEN J. J. VAN, 1993. Addition to the knowledge of the European *Chrysallida* species, which notes on a recent work by Van der Linden & Eikenboom (Gastropoda, Opistobranchia). *Basteria*, 57: 147-154.

MIENIS H. K., 1985. Is *Alvania dorbignyi* (Audouin, 1826) a Lessepsian migrant? *Levantina*, 59: 652-654.

MILACHEWITCH K. O., 1909. Liste des mollusques marins collectionnés en 1908 par K. P. Jagodovsky dans la Mer Noire prés des côtes du Caucase. *Annales du Museum de la Zoologique Académie des Sciences*, St. Petersburg, 14: 310-318.

MONTEROSATO T. DI MARIA, Marchese di, 1870. Sulla scoperta del genere *Dacrydium* nel Mediterraneo. *Bullettino Malacologico Italiano*, Pisa, 3 (2): 43-46.

MONTEROSATO T. DI MARIA, Marchese di, 1872. *Notizie intorno alle conchiglie mediterranee.* Ufficio Tipografico di Michele Amenta, Palermo, 61 pp.

MONTEROSATO T. DI MARIA, Marchese di, 1875. Nuova rivista delle conchiglie mediterranee. *Atti dell'Accademia Palermitana di Scienze, Lettere ed Arti*, Palermo, Sez. II, 5, 50 pp.

MONTEROSATO T. DI MARIA, Marchese di, 1877. Catalogo delle conchiglie fossili di Monte Pellegrino e Ficarazzi presso Palermo. *Bollettino Reale Comitato Geologico d'Italia*, Roma, **1-2**: 28-42.

MONTEROSATO T. DI MARIA, Marchese di, 1878a. Enumerazione e sinonimia delle conchiglie mediterranee. *Giornale Scienze Naturali ed Economiche*, Palermo, **13**: 61-115.

MONTEROSATO T. DI MARIA, Marchese di, 1878b. Note sur quelques coquilles provenant des côtes d'Algérie. Supplément. *Journal de Conchyliologie*, Paris, **26**: 313-321.

MONTEROSATO T. DI MARIA, Marchese di, 1880. Conchiglie della zona degli abissi. *Bullettino della Società Italiana*, Pisa, **6**: 50-82.

MONTEROSATO T. DI MARIA, Marchese di, 1884. *Nomenclatura generica e specifica di alcune conchiglie mediterranee.* Stab. Tipografico Virzì, Palermo, 152 pp.

MONTEROSATO T. DI MARIA, Marchese di, 1890. Conchiglie della profondità del mare di Palermo. *Naturalista Siciliano*, Palermo, 9(6): 140-151, (7): 157-166, (8): 181-191.

MONTEROSATO T. DI MARIA, Marchese di, 1899. Coquilles marines de Chypre. *Journal de Conchyliologie*, Paris, 47 (4): 392-401.

MOOLENBEEK R. G., HOENSELAAR H. J. & OLIVERIO M., 1991. The Rissoid species described by J. J. Oberling. *Bollettino Malacologico*, Milano, 27 (5-9): 107-120.

MUSETTI A., 1969. La famiglia Limidae nel Mediterraneo. *Conchiglie*, Milano, **5** (3-4): 48-56.

NARDO D., 1847. *Descrizione de' crostacei, de' testacei e de' pesci che abitano le lagune e golfo veneto rappresentati in figure, a chiaro-scuro ed a colori.* I. R. Priv. Stabilimento Antonelli, Venezia, 11-127.

NOFRONI I., 1986. Tavole sinottiche di Conchiologia mediterranea ed europea. Famiglia Nassariidae. Parte II. *La Conchiglia*, Roma, **18** (210-11): 13.

NOFRONI I. & TRINGALI L., 1995. Random notes on Eastern Atlantic, Mediterranean and lessepsian Pyramidellidae (Gastropoda: Heterobranchia: Pyramidelloidea). *Notiziario C.I.S.Ma*, Roma, **17**: 21-49.

NORDSIECK F., 1972. *Die europaischen Meeresschnecken (Opistobranchia mit Pyramidellidae; Rissoacea). Vom Eismeer bis Kapverden, Mittelmeer und Schwarzes Meer.* Stuttgart, 327 pp.

NORDSIECK F., 1976. The genus *Cerithiopsis* Forbes & Hanley, 1849 in the European seas. *La Conchiglia*, Roma, **8** (85-86): 6-7.

OBERLING J. J., 1970. Quelques espèces nouvelles de Gastéropodes du bassin Méditérranéen. *Kleine Mitteilungen Naturhistoriches Museum Bern*, **1**: 1-7.

OLIVERIO M., 1993. Sull'identità di *Alvania fractospira* Oberling, 1970 (Prosobranchia, Rissoidaea). *Notiziario C.I.S.Ma*, Roma, [1992], 14 (5-12): 33-36.

OLIVERIO M., 1995. The systematics of the radula-less gastropod *Clathromangelia* (Caenogastropoda, Conoidea). *Zoologica Scripta*, 24 (3): 193-205.

OLIVERIO M. & BUZZURRO G., 1994. A new Mediterranean species of the Genus *Homalopoma*, with notes on the Genus-Group (Trochoidea, Turbinidae, Colloniinae). *Bollettino Malacologico*, Milano, **30** (5-9): 182-188.

OLIVERIO M., AMATI B. & NOFRONI I., 1992. Revision of the *Alvania testae* group of species (Gastropoda, Prosobranchia, Truncatelloidea = Rissoidea). *Lavori S.I.M.*, Parma, [1990], 24: 249-259.

OLIVERIO M., BUZZURRO G. & VILLA R., 1994. A new eulimid gastropod from the Eastern Mediterranean Sea (Caenogastropoda, Ptenoglossa). *Bollettino Malacologico*, Milano, 30 (5-9): 211-215.

OLIVERIO M. & TRINGALI L., 1992. Two sibling species of Nassariinae in the Mediterranean Sea (Prosobranchia: Muricidae, Nassariinae). *Bollettino Malacologico*, Milano, 28 (5-12): 157-160.

PALLARY P., 1912. Catalogue des Mollusques du littoral Méditerranéen de l'Égypte. *Mémoires présentés a l'Institut Égyptien*. Librairie Dimier, Le Caire, 6 (1): 69-200, pl. XV (I)-XVIII (IV).

PARENZAN P., 1974. *Carta d'identità delle conchiglie del Mediterraneo*. Vol. I. Bio Taras Editrice, Taranto, 283 pp.

PEÑAS A., TEMPLADO J. & MARTINEZ J. L., 1996. Contribución al conocimiento de los Pyramidelloidea (Gastropoda: Heterostropha) del Mediterráneo español. *Iberus*, 14 (1): 82 pp.

PHILIPPI R. A., 1836. *Enumeratio Molluscorum Siciliae cum viventium tum in tellure tertiaria fossilium. 1.* Berolini Sumptibus Simonis Schroppii et sociorum. 267 pp., Tav. 1-12.

PHILIPPI R. A., 1844. *Enumeratio Molluscorum Siciliae cum viventium tum in tellure tertiaria fossilium. 2.* Halis Saxonum, Sumptibus Eduardi Anton. 303 pp., Tav. 13-28.

PHILIPPI R. A., 1847. *Abbildungen und Beschreibungen neuer oder wening gekannter Conchylien. Bd 2*, Lief. 2, T. Fischer, Cassel: 231 pp., 48 plts

PIANI P., 1980. Catalogo dei Molluschi conchiferi viventi nel Mediterraneo. *Bollettino Malacologico*, Milano, 16 (5-6): 113-220.

PONDER W. F., 1985. A Review of the Genera of the Rissoidae (Mollusca: Mesogastropoda: Rissoacea). *Records of the Australian Museum*, Sydney [1984]. Suplement 4: 221 pp.

POPPE G. T. & GOTO Y., 1990. *European seashells. (Polyplacophora, Caudofoveata, Solenogastra, Gastropoda).* Vol. 1. Verlag Christa Hemmen, 352 pp.

POPPE G. T. & GOTO Y., 1993. *European seashells. (Scaphopoda, Bivalvia, Cephalopoda).* Vol. 2. Verlag Christa Hemmen, 221 pp.

POWELL A. W. B., 1966. The Molluscan families Speightiidae and Turridae. An evaluation of the valid taxa, both Recent and fossil, with lists of caracteristic species. *Bullettin of the Auckland Institute and Museum*. Unity Press Ltd. Printers, Auckland, 5: 184 pp., 23 pl.

PRIOLO O., 1953. Nuova revisione delle conchiglie marine di Sicilia. Memoria V. *Atti dell'Accademia Gioenia di Scienze Naturali in Catania*, Tip. Zuccarello & Izzi, Catania, [1951-1952], serie sesta, 8: 109-135.

REEVE L. A., 1844. *Conchologia Iconica or illustrations of the shells of molluscous animals. Vol. I.* London.

REID D. G., 1986. The littorinid molluscs of mangrove forests in the Indo-Pacific region. The genus *Littoraria*. *British Museum (Natural History)*, London, 15: 228 pp., pl. 1.

REID D. G., 1989. The comparative morphology, phylogeny and evolution of the gastropod family Littorinidae. *Philosophical Transactions of the royal Society of London*, (B) 324 (1220): 1-110 pp., pl. 1-2.

REID D. G., 1996. *Systematics and evolution of Littorina*. The Ray Society, Andover, 463 pp.

RÉQUIEN E., 1848. *Catalogue des coquilles de l'ile de Corse.* Avignon, V-XII: 109 pp.

ROSEWATER J., 1970. The family Littorinidae in the Indo-Pacific. Part I. The Subfamily Littorininae. *Indopacific Mollusca*. The Department of Mollusks Deleware Museum of Natural History, Greenville, Delaware. Vol. 2 (11): 417-506, pl. 325-387.

SABELLI B., GIANNUZZI-SAVELLI R. & BEDULLI D., 1990. *Catalogo Annotato dei Molluschi Marini del Mediterraneo. Vol. 1*, Libreria Naturalistica Bolognese, Bologna, 348 pp.

SABELLI B., GIANNUZZI-SAVELLI R. & BEDULLI D., 1992. *Catalogo Annotato dei Molluschi Marini del Mediterraneo. Vol. 2,* Libreria Naturalistica Bolognese, Bologna: 349-498.

SABELLI B., GIANNUZZI-SAVELLI R. & BEDULLI D., 1992. *Catalogo Annotato dei Molluschi Marini del Mediterraneo. Vol. 3,* Libreria Naturalistica Bolognese, Bologna: 501-781 pp.

SABELLI B. & SPADA G., 1977. Guida illustrata all'identificazione delle conchiglie del Mediterraneo. Fam. Nassariidae. I. Supplemento a *Conchiglie*, Milano, 13 (9-10): 1- 3.

SALAS C., 1996. Marine Bivalves from off Southern Iberian Penisula collected by the Balgim and Fauna 1 expeditions. *Haliotis*, 33-100.

SALMAN A., KATAGAN T. & BENLI H. A., 1998. On the Cephalopod fauna of Northern Cyprus. *Israel Journal of Zoology*, 44: 47-51.

SARS G. O., 1878. *Bidrag om kundskaben om Norges arktiske fauna. I. Mollusca regionis arcticae Norwegiae.* Christiana, A. W. Brögger, 466 pp, 15 Tav.

SCHANDER C. & SUNDBERG P., 1997. Phylogenetic analysis of the Pyramidellidae (Mollusca) using sequences of the mitochondrial 16S gene. In C. SCHANDER: *Taxonomy and Phylogeny of the Pyramidellidae (Mollusca, Gastropoda, Heterobranchia)*, Department of Zoology, Göteborg. Part VII: 2-14.

SERVAIN G., 1880. *Étude sur les mollusques recueillis en Espagne et en Portugal.* Saint-Germain, Imprimerie D. Bardin, 172 pp.

SMITH E. A., 1888. Report on the Heteropoda collected by H. M. S. Challenger during the years 1873-76. *Voyage of H. M. S. Challenger, Zoology*, 23: 1-51.

SMRIGLIO C., MARIOTTINI P. & BUZZURRO G., 1998. The *Trivia spongicola* complex, with the description of a new species (Caenogastropoda; Triviidae). *Bollettino Malacologico*, Roma, 33 (9-12): 161-168.

SOWERBY G. B. I, 1823. *The genera of Recent and fossil shells*. London.

STAVRINOS G. N., 1984. *A guide to the sea shells of Cyprus*. Violaris Press, Nicosia, 79 pp.

TEBBLE N., 1976. *British bivalve seashells.* Second Edition. Published for the Royal Scottish Museum by her Majesty's Stationery Office. Edinburgh, 212 pp.

THIELE J., 1931. *Handbuch der systematischen Weichtierkunde. Loricata/Gastropoda. I: Prosobranchia (vorderkiemer).* A. Asher & Co., Jena, 778 pp.

TORNARITIS J., 1987. *Mediterranean Sea Shells Cyprus.* Prodos Print & Pub. Co. Ltd. Nicosia, 190 pp.

TRINGALI L., 1995. Qualche considerazione su *Retusa (R.) truncatula* (Bruguière, 1792) e *R. (R.) semisulcata* (Philippi, 1836) (Gastropoda: Opistobranchia: Cephalaspidea). *Notiziario C.I.S.Ma.*, Roma, [1994], 16: 31-34.

TRINGALI L., 1999. Nomenclatural notes on two Mediterranean gastropod species (Prosobranchia: Cerithiopsidae and Heterobranchia: Pyramidellidae). *Bollettino Malacologico*, Roma, [1998], 34 (9-12): 129-132.

TRINGALI L. & VILLA R., 1991. Qualche considerazione su *Vexillum hypatiae* (Pallary, 1912). *Notiziario C.I.S.Ma*, Roma, [1990], 13: 41-44.

TRINGALI L. & VILLA R., 1995. Sull'identità delle specie lessepsiane del genere *Anachis* H. & A. Adams, 1853, sottogenere *Zafra* A. Adams, 1860, rinvenute in Mar di Levante (Gastropoda: Prosobranchia: Columbellidae). *La Conchiglia*, Roma, 27 (274): 15-19.

TSURNAMAL M., 1969. *Cyprus expedition, field notes.* The Hebrew University of Jerusalem and the Smithsonian Institution Joint Research Project.

Biota of the Red Sea and Eastern Mediterranean. Jerusalem, 160-178.

VATOVA A., 1975. Genus *Protatlanta* Tesch, 1908. *Protatlanta souleyeti* (E. A. Smith, 1888). N. 46 delle "Schede Malacologiche del Mediterraneo", *Conchiglie*, Milano, 6 pp.

VERDUIN A., 1984. On the taxonomie of some Recent European marine species of the genus *Cingula* s. l. (Gastropoda: Prosobranchia). *Basteria*, 48 (1-3): 37-87.

VERDUIN A., 1986. *Alvania cimex* (L.) s. l. (Gastropoda, Prosobranchia), an aggregate species. *Basteria*, **50** (1-3): 25-32.

WALLER T. R., 1993. The evolution of *Chlamys* (Mollusca: Bivalvia: Pectinidae) from off Somalia, and the definition of a new tribe Decatopectinini. *Nautilus*, **100** (2): 39-46.

ZENETOS A., 1996. *The Marine Bivalvia (Mollusca) of Greece*. Fauna Graeciae. VII. Hellenic Zoological Society. Athens, 319 pp.

Lavoro accettato il 13 Dicembre 2002

Bollettino Malacologico, Roma, **39** (5-8): 79-104, [2003] 2004 - Società Italiana di Malacologia

The bathybenthic and pelagic molluscan fauna off the Levantine coast, eastern Mediterranean

Cesare Bogi and Bella S. Galil

KEY WORDS: New records, bathyal, benthic, pelagic, Levantine Basin, eastern Mediterranean.

ABSTRACT A total of 4580 molluscan specimens, identified to 43 species, have been collected during eleven cruises off the Mediterranean coast of Israel at depths between 734 and 1558 m. Much of the material examined consists of juvenile specimens and empty shells – only 23 species were represented by living specimens, 11 of these were represented solely by juvenile specimens. Five species constitute new records for the eastern Mediterranean, 8 are newly recorded from the Levantine sea. The deep waters of the eastern Mediterranean are effectively separated from the Atlantic Ocean by the shallow Gibraltar and Sicilian sills. Yet, the most common benthic molluscs in depths greater than 1000 m off the Israeli coast are of Atlanto-Mediterranean and Boreal distribution, either eurybathic species with upper bathymetric range well within the circalittoral, or having epipelagic larvae. Though the benthic molluscan fauna is considerably impoverished compared with the western Mediterranean, 12 of 13 of the Mediterranean pelagic thecosomate species were collected. The Quaternary anoxic events, combined with the barrier posed by the shallow Siculo-Tunisian sill, and the basin's oligotrophy provide a plausible explanation for the sparse and impoverished mollusc fauna in the Levantine bathyal.

RIASSUNTO Durante undici crociere oceanografiche intraprese al largo delle coste d' Israele a profondità comprese tra 734 e 1558 metri, sono stati raccolti 4580 esemplari di molluschi ascrivibili a 43 specie differenti. Gran parte del materiale esaminato è costituito da esemplari giovanili e conchiglie vuote. Solo 23 specie sono state rinvenute viventi e, tra queste, 11 specie sono rappresentate esclusivamente da esemplari giovanili. Cinque specie sono state raccolte per la prima volta nel Mediterraneo Orientale: *Akritogyra conspicua* (Monterosato, 1880), *Alvania electa* (Monterosato, 1874), *Turbonilla micans* (Monterosato, 1875), *Gleba cordata* Forskål, 1776, *Thyasira oblonga* (Monterosato, 1878). Otto specie costituiscono nuovi ritrovamenti per il Mar di Levante: *Carinaria lamarckii* (Peron & Lesueur, 1810), *Xenoskenea pellucida* (Monterosato, 1874), *Diacria trispinosa* (Lesueur, 1821), *Yoldiella philippiana* (Nyst, 1845), *Cyclopecten* cf. *hoskynsi* (Forbes, 1844), *Thyasira granulosa* (Monterosato, 1874), *Thyasira eumyaria* (Sars, M., 1870), *Allogramma formosa* (Jeffreys, 1882).
Nonostante le acque profonde del Mediterraneo Orientale siano separate dall'Oceano Atlantico da ben due barriere geografiche, le soglie poco profonde di Gibilterra e del Canale di Sicilia, i molluschi bentonici più comuni rinvenuti a profondità maggiori di mille metri al largo delle coste israeliane hanno affinità Atlanto-Mediterranea e Boreale. La loro presenza è spiegabile grazie all'elevata euribatia delle specie, presenti anche nel piano Circalitorale, e grazie alla presenza di larve epipelagiche a sviluppo planctotrofico. Benché la malacofauna dell'area appaia notevolmente impoverita in confronto a quella del Mediterraneo Occidentale, sono state raccolte 12 delle 13 specie pelagiche Mediterranee note di Thecosomata. L'anossia avvenuta nel Quaternario, le condizioni oligotrofiche del bacino, e la presenza della poco profonda soglia Siculo-Tunisina che ha funzionato da barriera, forniscono una plausibile spiegazione alla bassa diversità specifica ed alla bassa densità della malacofauna batiale del Mar di Levante.

C. BOGI, Via delle Viole 7, 57124 Livorno, Italy, E-mail: bogicesare@tiscali.it
B.S. GALIL, Israel Oceanographic & Limnological Research, National Institute of Oceanography, P.O.B. 8030, Haifa 31080, Israel, E-mail: bella@ocean.org.it

INTRODUCTION

The study of the Levantine Sea bathyal molluscs commenced with the voyages of the "POLA" (1890-1893), the most extensive deep-sea expedition to take place in the Levant Basin (STURANY, 1896). The Danish Oceanographical Expedition to the Mediterranean, aboard the "THOR", sampled nine sites along the western limits of the Levantine Sea, from Cyrenaica to Rhodes, in 1910. In 1987, the German research vessel "METEOR" [cruise 5] collected benthic samples at sites between Crete and Israel at depths ranging between 95 and 4396 m (JANSSEN, 1989). In 1993, the "METEOR" [cruise 25] obtained deep-sea biota from the region between Crete, Cyprus and Egypt at depths ranging between 200 and 2900 m (HIEKE *et al.*, 1994). The fauna of Eratosthenes Seamount, south of Cyprus, was briefly sampled by the "POSEIDON" [cruise 201/2] on February 1994 (GALIL & ZIBROWIUS, 1998). Thus, when discussing the Mediterranean deep sea gastropod fauna BOUCHET & TAVIANI (1992) declared that the *"Eastern Mediterranean is the least adequately sampled region"*.
A series of eleven cruises conducted between 1994 and 1999 as part of pollution monitoring surveys by the Israel Oceanographic and Limnological Research (IOLR) off the northern coast of Israel, at depths between 734 and1558 m, added to our knowledge of the Levantine bathyal mollusc fauna.

STUDY AREA

The Levantine Sea at the easternmost Mediterranean, east of the line connecting Rhodes and Cyrenaica is isolated from the deep Atlantic and western Mediterranean waters by the shallow Gibraltar Straits and the Siculo-Tunisian sill.
The Levantine deep water mass is distinguished by salinity and temperature values that are higher than in the rest of the Mediterranean (T< 13.8°C, S < 38.74, below 700 m) (HECHT *et al.*, 1988). The Levantine Sea is ultra-oligotrophic (BERMAN *et al.*, 1984; KROM *et al.*, 1991). Chlorophyll-a concentrations are as low as 0.4 µg l-1 nearshore, and decrease offshore to 0.05 µg l-1 (BERMAN *et al.*, 1986; YACOBI *et al.*, 1995).
The area investigated is located off the northern coast of Israel, at depths between 734 and 1558 m (Plate 1, table 1).

MATERIALS AND METHODS

The material was collected during some monitoring surveys of two deepwater waste-dumping sites: an acidic sludge disposal site off

Haifa, coal fly ash site off Hadera, and a control site off Atlit. The samples were collected using a 0.5 mm plankton net secured atop a Marinovich-type deep water trawl. The sample was preserved in 10% buffered formalin aboard ship. In the laboratory samples were washed and sieved through a 500 µm mesh, preserved in 70% alcohol, and stained in Rose Bengal. The sorted material was sent to Livorno for identification. The material is deposited in the collection of the first author and the National collection, Tel Aviv University. Taxonomy follows the Check List of European Marine Mollusca (http://www.mnhn.fr/mnhn/bimm/clemam).
For each species only records within the Levantine sea and adjacent areas (southern Aegean sea, eastern Ionian sea) are cited, or, if none known, the easternmost Mediterranean record. Only synonyms used in the cited records are given. The number of specimens in each sample is given in parenthesis following the station number.

Plate 1. Map of the Mediterranean coast of Israel showing the locations of the Investigated areas (see also table 1). A, Haifa; B, Hadera; C, Atlit.
Tavola 1. Mappa delle coste Mediterranee di Israele con l'indicazione delle aree studiate (vedi anche tab.1). A, Haifa; B, Hadera; C, Atlit.

Gastropoda Cuvier, 1797
Prosobranchia Milne Edwards, 1848
Vetigastropoda Salvini-Plawen & Haszprunar, 1987
Trochoidea Rafinesque, 1815
Skeneidae Clark, 1851
Akritogyra conspicua (Monterosato, 1880)
Distribution.- Mediterranean endemic. Central and Western Mediterranean (Warén, 1992).
Material examined.- 97HF1 (2 + 12 juvs.); living specimens.
Remarks.- First record in the Eastern Mediterranean.

Caenogastropoda Cox, 1959
Rissooidea Gray, 1847
Rissoidae Gray, 1847
Alvania electa (Monterosato, 1874)
Distribution.- Atlantic-Mediterranean. Sicily (Carus, 1893).
Material examined.- 95700 (2); living specimens.
Remarks.- First record in the Eastern Mediterranean.

Benthonella tenella (Jeffereys, 1869)
Plate 2, Figure A.
Distribution.- Atlantic-Mediterranean. Crete (Janssen, 1989; Koutsoubas *et al.*, 1992); southwest of Cyprus, 34.08.27N, 31.52.52'E (Janssen, 1989); Israel (Janssen, 1989).
Material examined.- 94H15 (1); 95HF1 (11); 95HF2 (2); 95HF3 (2); 95HF8 (12); 95HF9 (1); 95H4 (2); 95H7 (1); 95H13 (4); 95H14 (1); 95H15 (1); 95H19 (1); 95H20 (1); 96A1 (1); 96A2 (4); 96A5 (1); 96A6 (1); 96HA (1); 96H4 (2); 96H6 (2); 96H14 (1); 96H20 (1); 97H7 (10); 97H14 (3); 97H19 (2); 97H21 (5); 97H52 (4); 97HF1 (3); 97HF2 (2); 97HF3 (3); 97HF4 (2); 97HF6 (3); 97HF7 (3); 97HF8 (1); 97HF9 (6); 98H4 (3); 98H15 (11); 98H19 (9); 98H20 (8); 98H21 (4); 98H23 (5); 98H24 (8); 98H25 (3); 98H26 (9); 98H27 (7); 99A1 (2); 99A3 (3); 99A4 (3); 99A6 (32); 99A7 (4); 99H7 (2); 99H15 (3); 99H19 (2); 99H20 (3); 99H21 (1); 99H23 (2); 99H25 (1); 99H27 (3); 99H28 (1). A total of 230 living specimens, about 80% juveniles.

Firoloidea Rafinesque, 1815
Atlantidae Rang, 1829
Atlanta fusca Souleyet, 1852
Distribution.- Cosmopolitan. South Aegean Sea (Kiortosis, 1969; Kotsoubas *et al.*, 1997); Levant sea (Vatova, 1974); Israel (Van Aartsen *et al.*, 1989).
Material examined.- 94H19 (1); 94A4 (1); 95A4 (1); 97H14 (1); 99A6 (13). A total of 17 adult shells, no living specimens.

Atlanta peronii Lesueur, 1817
Distribution.- Cosmopolitan. South Aegean Sea (Kotsoubas *et al.*, 1997); Crete, (Forbes, 1844; Jeffreys, 1883; Koutsoubas *et al.*, 1992); Cyclades (Forbes, 1844); Dodecanese (Forbes, 1844); Israel (Barash & Danin, 1992).
Material examined.- 94H6 (1); 96HA (11); 96H4 (3); 96H6 (1); 96H14 (1); 97H7 (1); 97H19 (1); 97H52 (3); 97HF1 (4); 97HF3 (3); 97HF7 (3); 97HF8 (3); 97HF9 (9); 98H15 (9); 98H19 (3); 98H20 (2); 98H22 (4); 98H23 (2); 98H25 (2); 98H28 (2); 99A1 (1); 99A3 (1); 99A5 (1); 99A6 (88); 99A7 (2); 99H4 (2); 99H19 (2); 99H21 (1); 99H23 (1); 99H27 (5). A total of 172 adult shells, no living specimens.

Oxygyrus keraudrenii (Lesueur, 1817)
Bellerophina minuta Forbes, 1844:186.
Distribution.- Cosmopolitan. South Aegean Sea (Forbes, 1844; Kotsoubas *et al.*, 1997); Levant sea (Vatova, 1974); Israel (Barash & Danin, 1992).
Material examined.- 94A1 (1); 94A4 (1); 94A7 (1); 95A1 (1); 95A4 (1); 95A7 (1); 97H21 (2). Juvenile shells only.

Carinariidae De Blainville, 1818
Carinaria lamarckii (Peron & Lesueur, 1810)
Distribution.- Cosmopolitan. Ionian sea (Vatova, 1974).
Material examined.- 99A6 (1 juv.) shell.
Remarks.- First record in the Levant sea.

Firolidae Rafinesque, 1815
Firoloida desmarestia Lesueur, 1817

Plate 2, Figures B,C.
Cyclostrema minutum Jeffereys, 1883:395, pl. 16, fig. 1.
Cyclostrema solutum Di Geronimo, 1974:148.
Distribution.- Atlantic-Mediterranean. South Aegean Sea (Jeffreys, 1883; Kotsoubas *et al.*, 1992, 1997); Aegean (Moraitou-Apostolopoulou, 1985); Israel (Barash & Danin, 1992).
Material examined.- 99A6 (72) adult shells, no living specimens.

Conoidea Rafinesque, 1815
Conidae Rafinesque, 1815
Microdrillia loprestiana (Calcara, 1841)
Pleurotoma loprestianum Sturany, 1896:10.
Distribution.- Atlantic-Mediterranean. Crete (Jeffreys, 1883; Sturany, 1896; Koutsoubas *et al.*, 1992; 1997); Dodecanese (Sturany, 1896); Libya (Sturany, 1896); Rhodes (Zenetos & Van Aartsen, 1995); Israel (Haas, 1951; Barash & Danin, 1992).
Material examined.- 97H52 (1 juv.) living specimen.

Benthomangelia macra (Watson, 1881)
Plate 3, Figures A-C.
Pleurotoma (Mangelia) macra Sturany, 1896:11.
Distribution.- Atlantic-Mediterranean. Crete, (Sturany, 1896; Janssen, 1989; Koutsoubas *et al.*, 1992; 1997; 2000); Dodecanese (Sturany, 1896); Southwest of Cyprus, 34.08.27N, 31.52.52'E (Janssen, 1989); Israel (Janssen, 1989).
Material examined.- 94H5 (1); 94H15 (2); 94H16 (1); 94H19 (1); 94A1 (1); 94A5 (1); 94A7 (1); 95A5 (1); 95A7 (1); 95HF2 (2); 95HF3 (5); 95HF6 (2); 95HF8 (5); 95HF9 (1); 95H4 (5); 95H7 (4); 95H13 (3); 95H15 (1); 95H19 (4); 96A1 (1); 96A2 (1); 96A3 (1); 96HA (1); 96H6 (4); 96H20 (3); 97H7 (1); 97H21 (2); 97H52 (3); 97HF1 (2); 97HF6 (1); 98H20 (3); 98H21 (4); 98H23 (2); 98H24 (2); 98H25 (2); 98H26 (3); 98H27 (2); 98H28 (2); 99A4 (2); 99A6 (5); 99A7 (5); 99H7 (2); 99H19 (2); 99H20 (2); 99H21 (3); 99H23 (2); 99H25 (1); 99H27 (2); 99H28 (2); 99H29 (2). A total of 112 living specimens, about 90% juveniles.

Heterobranchia Gray, 1840
Heterostropha Fisher, P., 1885
Valvatoidea Gray, 1840
Hyalogyrinidae Warén & Bouchet, 1992
Xenoskenea pellucida (Monterosato, 1874)
Distribution.- Atlantic-Mediterranean. Central and Western Mediterranean (Warén *et al.*, 1993); South Aegean Sea (Tenekidis, 1989; Koutsoubas *et al.*, 1997).
Material examined.- 95HF2 (1, juv.); 95HF8 (1, juv.); shells.
Remarks.- First record in the Levantine sea.

Pyramidelloidea Gray, 1840
Pyramidellidae Gray, 1840
Chrysallida flexuosa (Monterosato, 1874)
Distribution.- Atlantic-Mediterranean. Crete (Karakassis, 1991; Koutsoubas *et al.*, 2000); Israel (Carrozza, 1984).
Material examined.- 95700 (1) living specimen.

Turbonilla micans (Monterosato, 1875)

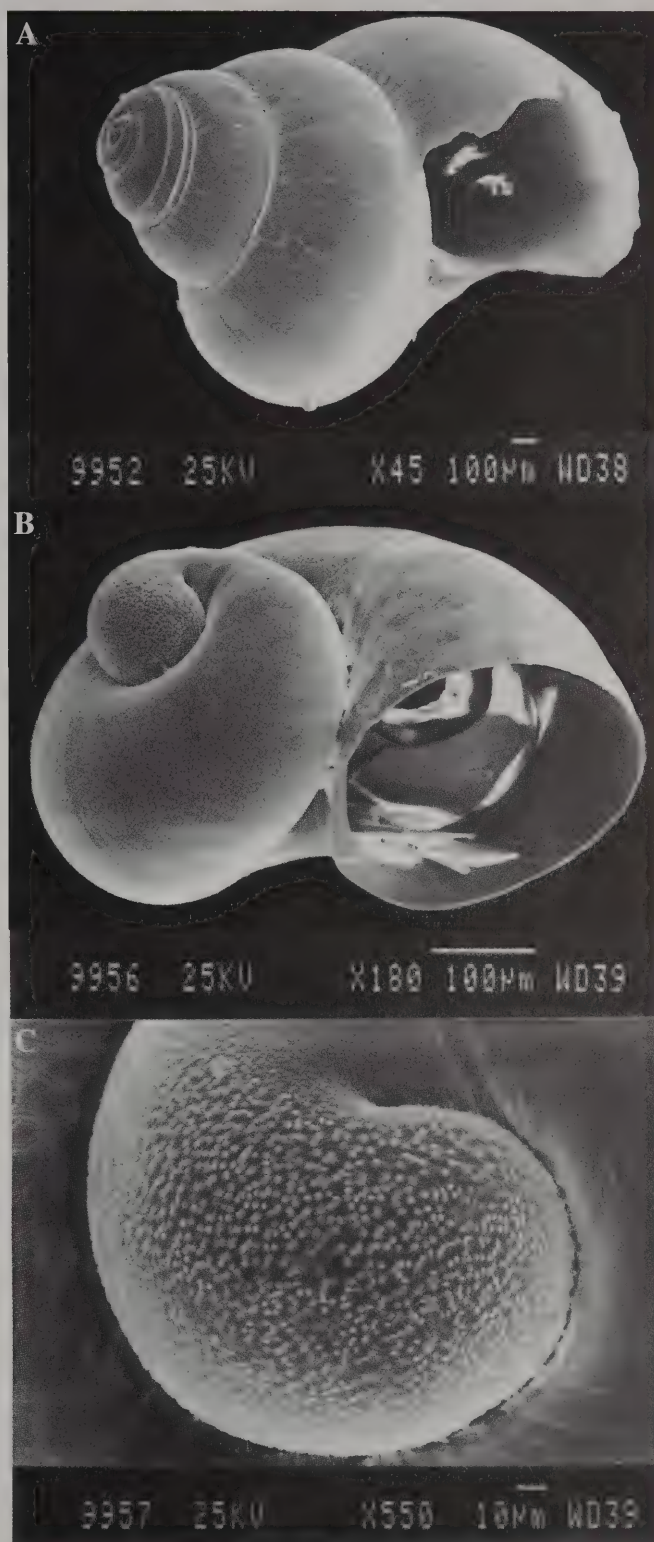



Plate 2. *Benthonella tenella* (Jeffreys, 1869), A. x 45; *Firoloida desmarestia* Lesueur, 1817, B. x 180; C. x 550 detail of protoconch.

Distribution.- Atlantic-Mediterranean.
Material examined.- 97HF9 (2); 99H23 (1); adult, living specimens.
Remarks.- First record in the Eastern Mediterranean.

Opistobranchia Milne Edwards, 1848
Cephalaspidea Fisher, P., 1883
Acteonidae D'Orbigny, 1842
Crenilabium exile (Jeffreys, 1870)
Distribution.- Atlantic-Mediterranean. Aegean Sea (Carus, 1893; Koutsoubas & Koukouras, 1993); Crete, (Janssen, 1989; Koutsoubas *et al.*, 1992; 2000); Rhodes (Tenekidis, 1989; Zenetos & Van Aartsen, 1995); Israel (Janssen, 1989; s, 1992).
Material examined.- 98H23 (1); 98H27 (1); 99A6 (1); juvenile, living specimens.

Cylichnidae Adams, H. & A., 1854
Roxania utriculus (Brocchi, 1814)
Bulla utriculus Forbes, 1844:164.
Distribution.- Atlantic-Mediterranean. Aegean Sea (Koutsoubas & Koukouras, 1993); Crete, (Forbes, 1844; Koutsoubas *et al.*, 1992); Cyclades (Forbes, 1844); Rhodes (Tenekidis, 1989; Zenetos & Van Aartsen, 1995); Israel (Haas, 1951; Barash & Danin, 1971, 1992).
Material examined.- 97HF9 (1 juv.) shell only.

Thecosomata De Blainville, 1824
Euthecosomata Meisenheimer, 1905
Cavoliniidae Gray, 1850
Cavolinia gibbosa gibbosa (D'Orbigny, 1835)
Hyalea gibbosa Forbes, 1844:132.
Distribution.- Endemic to the eastern Mediterranean. Aegean Sea (Rampal, 1970; Koutsoubas & Koukouras, 1993); Crete, (Forbes, 1844; Jeffreys, 1883); Egypt (Rampal, 1970); Cyprus (Rampal, 1970); Israel (Almogi-Labin & Reiss, 1977; Barash & Danin, 1971, 1992).
Material examined.- 99A6 (2) adult specimens, shell only.
Remarks.- The morphological characters of our specimens correspond to the eastern Mediterranean subspecies, which is distinguished from *C. gibbosa flava* (rarely collected in the Mediterranean) in its more rounded ventral surface. Corselli and Grecchi (1987, 1990) considered *C. gibbosa gibbosa* a geographically-isolated entity of a recent (Holocene) penetration from the Atlantic Ocean.

Cavolinia inflexa (Lesueur, 1813)
Distribution.- Cosmopolitan. Aegean Sea (Forbes, 1844; Koutsoubas & Koukouras, 1993); Levantine basin (Pastouret, 1970; Rampal, 1975).
Material examined.- 99A6 (5) adult specimens, shells only.

Diacria trispinosa (Lesueur, 1821)
Distribution.- Cosmopolitan. Aegean Sea (Pastouret, 1970; Rampal, 1975; Koutsoubas & Koukouras, 1993).
Material examined.- 99A6 (1) single broken shell.
Remarks.- Though *D. trispinosa* is widely distributed in the Mediterranean, its presence in the sea was considered accidental by Corselli and Grecchi (1990). First record in the Levantine sea.

Clio pyramidata lanceolata (Lesueur, 1813)
Cleodora pyramidata Forbes, 1844:132.
Distribution.- Indo West Pacific Ocean, Eastern Atlantic, Mediterranean. Crete (Forbes, 1844; Koutsoubas & Koukouras, 1993); Cyclades (Forbes, 1844); Asia Minor (Forbes, 1844); Cyprus (Tornaritis, 1987; Cecalupo & Quadri, 1996).
Material examined.- 94A1 (2); 95A1 (1); 98H24 (2); 98H26 (1); 98H28 (2); 99A6(160). A total of 168 adult specimens, shells only. Many more fragments were collected, but not counted.
Remarks.- Most reports of this species refer to a subspecies known from the Mediterranean only from shells (Bedulli *et al.*, 1995). The specimens collected off the Israeli coast present the morphological characters of the subsp. *C. pyramidata lanceolata* (Rampal, 1975).

Clio cuspidata (Bosc, 1802)
Cleodora cuspidata Forbes 1844:132.
Distribution.- Cosmopolitan. Aegean Sea (Koutsoubas & Koukouras, 1993); Crete (Forbes, 1844); Cyprus (Tornaritis, 1987); Israel (Almogi-Labin & Reiss, 1977; Barash & Danin, 1992).
Material examined.- 99A6 (3) adult specimens, shells only.

Creseis acicula Rang, 1828
Distribution.- Cosmopolitan. Aegean (Moraitou-Apostolopoulou, 1985; Koutsoubas & Koukouras, 1993); Crete (Jeffreys, 1883; Koutsoubas *et al.*, 1992); northern Levantine Sea (Berdugo & Kimor, 1967); Egypt (Vatova, 1974); Israel (Berdugo & Kimor, 1967; Almogi-Labin & Reiss, 1977; Barash & Danin, 1971, 1992).
Material examined.- 99A6 (4) adult specimens, shells only.

Creseis virgula virgula Rang, 1828
Distribution.- Cosmopolitan. Aegean Sea (Koutsoubas & Koukouras, 1993); Crete (Koutsoubas *et al.*, 1992); Egypt (Vatova, 1974); Israel (Almogi-Labin & Reiss, 1977; Barash & Danin, 1971, 1992).
Material examined.- 94A4 (1); 95A4 (1); 99A6 (18), adult specimens, shells only.

Hyalocylis striata (Rang, 1828)
Criseis striata Forbes, 1844:132.
Distribution.- Atlantic-Mediterranean. Aegean Sea (Rampal, 1970; Koutsoubas & Koukouras, 1993); Crete (Forbes, 1844); Cyclades (Forbes, 1844); Asia Minor (Forbes, 1844); Cyprus (Rampal, 1970); Libya (Rampal, 1970); Egypt (Rampal, 1970); Israel (Almogi-Labin & Reiss, 1977; Barash & Danin, 1992).
Material examined.- 96H4 (1); 99A6 (3) juvenile specimens, shells only.

Styliola subula (Quoy & Gaimard, 1827)
Clio subula Jeffreys, 1883:401.
Distribution.- Cosmopolitan. Crete (Jeffreys, 1883); Cyprus (Cecalupo & Quadri, 1996); Israel (Almogi-Labin & Reiss, 1977; Barash & Danin, 1971, 1992).
Material examined.- 94H5 (3); 94H15 (3); 95A1 (1); 94A2 (3); 94A7 (3); 95A2 (3); 95A7 (3); 95HF1 (1); 95HF8 (1); 95HA (2); 95H15 (3); 95H19 (1); 96H4 (2); 96H14 (2); 97H14 (1); 97H21 (1); 97HF7 (1); 98H21 (1); 99A4 (1); 99A6 (277); 99A7 (1). A total of 314 adult specimens, shells only.

Limacinidae Gray, 1840

Limacina trochiformis (D'Orbigny, 1836)
Spirialis trochiformis Jeffreys, 1883:401.
Spiratella trochiformis Vatova, 1974:107.
Distribution.- Tropical and subtropical seas. Aegean Sea (Vatova, 1974; Koutsoubas & Koukouras, 1993); Crete (Jeffreys, 1883; Carus, 1893; Koutsoubas *et al.*, 1992); Rhodes (Berdugo & Kimor, 1967); Cyprus (Bogi *et al.*, 1989); Israel (Almogi-Labin & Reiss, 1977; Barash & Danin, 1992).
Material examined.- 94A1 (1); 94A4 (1); 95A1 (1); 95A4 (1); 95H4 (1); 95H13 (2); 95H19 (2); 95700 (1); 99A6(411). A total of 421 adult shells, no living specimens.

Limacina inflata (D'Orbigny, 1836)
Distribution.- Cosmopolitan. Aegean Sea (Koutsoubas & Koukouras, 1993); Crete (Jeffreys in Carus, 1893; Berdugo & Kimor, 1967; Koutsoubas *et al.*, 1992); northern Levantine Basin (Berdugo & Kimor, 1967); Cyprus (Bogi *et al.*, 1989); Israel (Berdugo & Kimor, 1967; Barash & Danin, 1971, 1992; Almogi-Labin & Reiss, 1977).
Material examined.- 94H16 (1); 94A2 (2); 94A4 (3); 94A7 (2); 95A2 (2); 95A4 (3); 95A7 (2); 95HF7 (1); 95HA (3); 95H7 (1); 95H13 (2); 95H15 (1); 95H19 (1); 96A2 (1); 96A3 (1); 96HA (5); 96H4 (10); 96H20 (1); 97HF1 (3); 97HF9 (7); 99A4 (1); 99A6 (445). A total of 498 adult shells, no living specimens.

Peraclidae Tesch, 1913
Peracle reticulata (D'Orbigny, 1836)
Distribution.- Cosmopolitan. Aegean Sea (Vatova, 1974; Koutsoubas & Koukouras, 1993); Israel (Almogi-Labin & Reiss, 1977; Barash & Danin, 1992).
Material examined.- 99A6 (8) adult specimens, shells only.

Cymbuliidae Gray,1840
Gleba cordata Forskål, 1776
Plate 4, Figure A.
Distribution.- Cosmopolitan. Between Sicily and Libya (Rampal, 1975).
Material examined.- 99A6 (31). Adult specimens, shells only.
Remarks.- First record in the Eastern Mediterranean.

Bivalvia Linnaeus, 1758
Protobranchia Pelseneer, 1889
Nuculoida Dall, 1889
Yoldiidae Glibert & Van De Poel, 1965
Yoldia micrometrica (Seguenza, G., 1877)
Plate 4, Figure B.
Distribution.- Atlantic-Mediterranean. Crete (Janssen, 1989; Koutsoubas *et al.*, 1992); Eratosthenes seamount (Galil & Zibrowius, 1998); Israel (Janssen, 1989).
Material examined.- 94H3 (1); 94H4 (4); 94H5 (1); 94H6 (1); 94H7 (1); 94H9 (1); 94H19 (1); 94A1 (1); 94A4 (2); 94A5 (9); 94A1 (1); 95A1 (1); 95A4 (2); 95HF1 (20); 95HF2 (7); 95HF3 (16); 95HF4 (4); 95HF6 (3); 95HF7 (12); 95HF8 (37); 95HF9 (7); 95HA (19); 95H4 (27); 95H7 (4); 95H13 (8); 95H14 (7); 95H15 (11); 95H19 (6); 95H20 (6); 96A1 (18); 96A2 (6); 96A3 (2); 96A4 (7); 96A5 (4); 96A6 (5); 96HA (15); 96H4 (10); 96H6

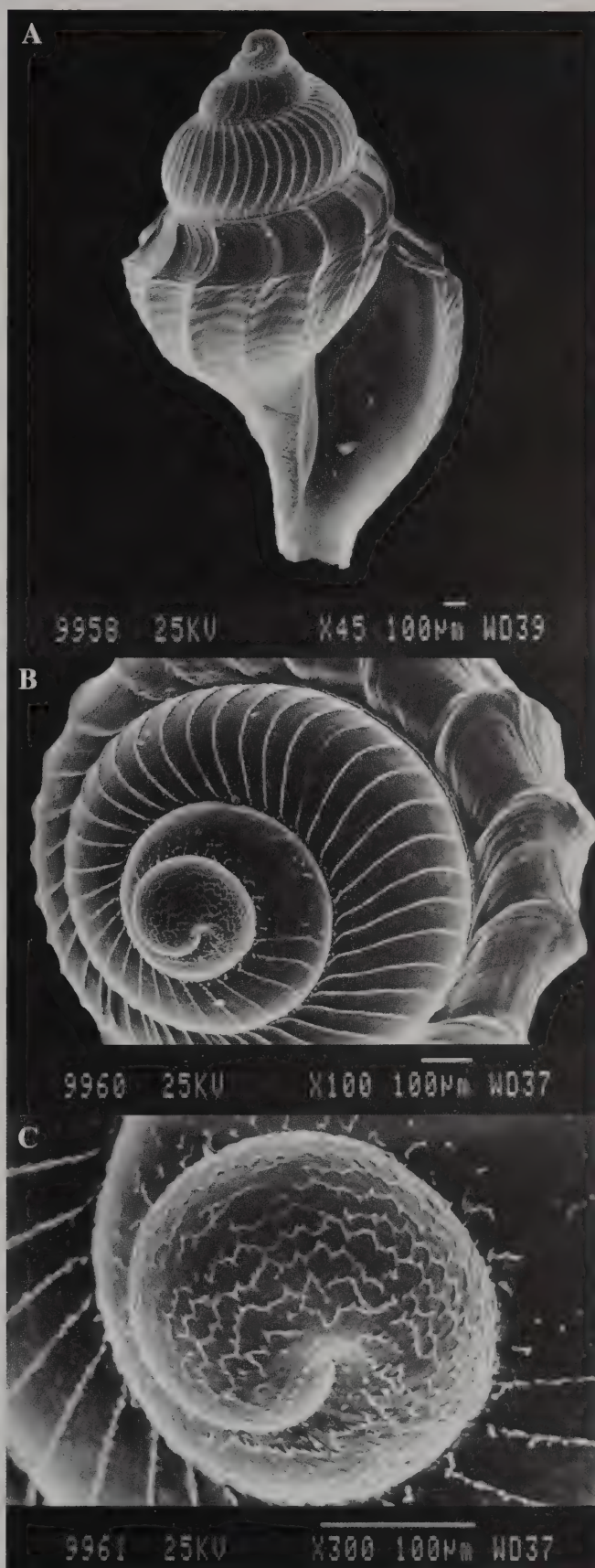



Plate 3. *Benthomangelia macra* (Watson, 1881). A. x 45; B. x 100 detail of protoconch; C. x 300 detail of protoconch.

(12); 96H14 (6); 96H20 (20); 97H7 (7); 97H14 (21); 97H19 (5); 97H21 (29); 97H51 (14); 97H52 (25); 97HF1 (19); 97HF3 (15); 97HF4 (2); 97HF6 (3); 97HF7 (7); 97HF8 (16); 97HF9 (37); 98H4 (19); 98H7 (2); 98H19 (8); 98H20 (22); 98H21 (18); 98H22 (6); 98H23 (13); 98H24 (8); 98H25 (21); 98H26 (9); 98H27 (26); 98H28 (9); 99A1 (4); 99A3 (3); 99A4 (7); 99A6 (2); 99A716 (2); 99H4 (24); 99H7 (3); 99H15 (11); 99H19 (19); 99H20 (9); 99H21 (21); 99H23 (11); 99H24 (4); 99H25 (5); 99H26 (3); 99H27 (12); 99H28 (1); 99H29 (1). A total of 827 living specimens, 80% juveniles.
Remarks.- *Y. micrometrica* is the most common and abundant species in our samples. As far as we can determine it is the first record of *Y. micrometrica* being collected in great numbers in the Mediterranean bathyal, conceivably, the species took advantage of the lack of competitors to occupy an empty ecological niche. Most of the specimens are juveniles.

Yoldiella philippiana (Nyst, 1845)
Arca (Bathyarca) koreni sensu (Kobelt, 1891) non (Danielseen, 1859).
Distribution.- Atlantic-Mediterranean. Lybia (STURANY, 1896); Crete (STURANY, 1896); Cyclades (STURANY, 1896).
Material examined.- 94H16 (1); 95HF7 (2); 96A1 (1); 96H4 (1); 96H6 (1); 96H14 (1); 97HF7 (1); living, juvenile specimens.
Remarks.- First record in the Levantine sea.

Pteromorphia Beurlen, 1944
Arcoida Stoliczka, 1871
Arcidae Lamark, 1809
Bathyarca pectunculoides (Sacchi, 1834)
Arca pectunculoides Jeffreys, 1883:394.
Arca (Bathyarca) pectunculoides Sturany, 1896:20.
Distribution.- Boreal. Aegean Sea (JEFFREYS in CARUS, 1893); Crete (JEFFREYS, 1883; STURANY, 1896; JANSSEN, 1989; KOUTSOUBAS *et al.*, 2000); Libya (STURANY, 1896); Dodecanese (STURANY, 1896); Rhodes (ZENETOS & VAN AARTSEN, 1995); Israel (JANSSEN, 1989; BARASH & DANIN, 1992).
Material examined.- 94H15 (1); 95HF1 (2); 95HF8 (2); 95HF9 (1); 95HA (2); 95H4 (1); 95H7 (2); 95H13 (2); 95H14 (1); 95H15 (1); 96A4 (1); 96H4 (2); 96H14 (1); 97H7 (5); 97H14 (2); 97H19 (3); 97H21 (2); 97H51 (2); 97H52 (4); 97HF1 (2); 97HF3 (3); 97HF7 (1); 98H20 (2); 98H21 (1); 98H22 (4); 99A4 (1); 99A6 (1); 99H7 (2); 99H15 (4); 99H19 (1); 99H21 (2); 99H23 (2); 99H27 (1). A total of 64 living specimens, 50% juveniles.

Bathyarca philippiana (Nyst, 1848)
Distribution.- Atlantic-Mediterranean. Crete (JANSSEN, 1989; KOUTSOUBAS *et al.*, 1992); Eratosthenes seamount (GALIL & ZIBROWIUS, 1998).
Material examined.- 94A5 (5 juvs.), living specimens.

Pterioida Newell, 1965
Limidae Rafinesque, 1815
Limatula subauriculata (Montagu, 1808)
Lima elongata Forbes, 1844:192.
Lima (Limatula) subauriculata Sturany, 1896:21.
Distribution.- Boreal. Aegean Sea (JEFFREYS, 1879); Crete (FORBES, 1844; STURANY, 1896; KOUTSOUBAS *et al.*, 1992; 2000); Libya (STURANY, 1896); Cyclades (FORBES, 1844); Dodecanese (FORBES, 1844); Israel (BARASH & DANIN, 1992).
Material examined.- 97HF9-(53).

Pectinidae Rafinesque, 1815
Cyclopecten cf. hoskynsi (Forbes, 1844)
Pecten hoskynsi Forbes, 1844:192.
Pecten (Amussium) hoskynsi Sturany, 1896:20.
Distribution.- Atlantic-Mediterranean. Aegean Sea (JEFFREYS, 1879); Crete (KOUTSOUBAS *et al.*, 2000); Asia minor (FORBES, 1844); Cyclades (STURANY, 1896); Dodecanese (STURANY, 1896); Libya (STURANY, 1896).
Material examined.- 99H27 (1), valve of adult specimen.
Remarks.- First record in the Levantine sea.

Heterodonta Neumayr, 1884
Veneroida Adams, H. & A., 1857
Thyasiridae Dall, 1900
Thyasira granulosa (Monterosato, 1874)
Distribution.- Atlantic-Mediterranean. Crete (KOUTSOUBAS *et al.*, 1992); Rhodes (ZENETOS & VAN AARTSEN, 1995).
Material examined.- 97HF9 (1 juv.) living specimen.
Remarks.- First record in the Levantine sea.

Thyasira oblonga (Monterosato, 1878)
Plate 4 , Figure C.
Distribution.- Atlantic-Mediterranean.
Material examined.- 95HF2 (4); 95HF7 (2) living adult specimens.
Remarks.- This species was often erroneously described and depicted as *Thyasira* (or *Leptaxinus*) *subovata* (JEFFREYS, 1881), a species we consider distinct from *Thyasira oblonga* (GIRIBET & PEÑAS, 1997; CECALUPO & GIUSTI, 1989). First record in the Eastern Mediterranean.

Thyasira eumyaria (Sars, M., 1870)
Distribution.- Ionian Sea (PARENZAN, 1976; DI GERONIMO, 1974).
Material examined.- 95HA (1); 96A1 (1); 96H4 (2); 98H28 (1); 99H27 (1) living specimens, 2 adults, 4 juveniles.
Remarks.- First record in the Levantine Sea.

Semelidae Stoliczka, 1870
Abra longicallus (Scacchi, 1834)
Scrobicularia longicallis Jeffreys, 1883:395.
Syndosmya longicallis Sturany, 1896:15.
Distribution.- Atlantic-Mediterranean. Crete (JEFFREYS, 1883; JEFFREYS in CARUS, 1893; STURANY, 1896; KOUTSOUBAS *et al.*, 1992; 2000). Libya (STURANY, 1896); Cyclades (STURANY, 1896); Dodecanese (STURANY, 1896); Rhodes (JEFFREYS, 1881a; ZENETOS & VAN AARTSEN, 1995); Cyprus (HADJICHRISTOPHOROU *et al.*, 1997); Israel (JANSSEN, 1989).
Material examined.- 97HF9 (1 juv.) living specimen.

Kelliellidae Fischer, P., 1887

Kelliella abyssicola (Forbes, 1844)

Kellia abyssicola Forbes, 1844:192.

Kelliella miliaris Sturany, 1896:17.

Distribution.- Boreal. Crete (Forbes, 1844; Sturany, 1896; Janssen, 1989; Koutsoubas *et al.*, 1992; 2000); Libya (Sturany, 1896); Cyclades (Forbes, 1844); Dodecanese (Sturany, 1896); Asia Minor (Forbes, 1844); Rhodes (Zenetos & Van Aartsen, 1995); Eratosthenes seamount (Galil & Zibrowius, 1998); Israel, (Janssen, 1989).

Material examined.- 94H4 (3); 94H5 (7); 94H15 (5); 94H16 (2); 94H19 (5); 94A1 (1); 94A2 (1); 94A5 (12); 94A6 (1); 95A1 (1); 95A2 (1); 95A6 (1); 95HF1 (10); 95HF2 (4); 95HF3 (6); 95HF4 (2); 95HF6 (3); 95HF7 (3); 95HF8 (11); 95HF9 (2); 95HA (8); 95H4 (10); 95H7 (5); 95H13 (7); 95H14 (4); 95H15 (7); 95H19 (11); 95H20 (1); 95700 (66); 96A1 (7); 96A2 (1); 96A3 (2); 96A4 (1); 96A5 (1); 96A6 (1); 96HA (13); 96H4 (14); 96H6 (8); 96H14 (3); 96H20 (8); 97H7 (9); 97H13 (1); 97H14 (6); 97H21 (7); 97HF1 (22); 97HF2 (3); 97HF3 (9); 97HF4 (3); 97HF6 (2); 97HF7 (3); 97HF8 (16); 98H4 (5); 98H7 (3); 98H15 (7); 98H19 (3); 98H20 (6); 98H21 (6); 98H22 (4); 98H23 (7); 98H24 (6); 98H25 (8); 98H26 (7); 98H27 (6); 98H28 (4); 99A3 (1); 99A6 (112); 99A7 (1); 99H4 (3); 99H7 (2); 99H15 (2); 99H19 (5); 99H20 (6); 99H21 (8); 99H23 (2); 99H26 (3); 99H27 (3); 99H29 (2). A total of 561 living specimens, 50% juveniles.

Anomalodesmata Dall, 1889

Pholadomyoida Newell, 1965

Lyonsiidae Fischer, P., 1887

Allogramma formosa (Jeffreys, 1882)

Lyonsia aegeensis Sturany 1896:15.

Lyonsia formosa aegeensis Parezan, 1976:390.

Distribution.- Atlantic-Mediterranean. Sicily (Jeffreys, 1881b).

Material examined.- 95HA (1 juv.); 97H52 (1 juv.) broken, living specimens.

Remarks.- First record in the Levantine Sea.

Cuspidariidae Dall, 1886

Cuspidaria rostrata (Spengler, 1793)

Neaera rostrata Sturany, 1896:16.

Distribution.- Atlantic-Mediterranean. Aegean Sea (Jeffrey in Carus, 1893); Crete (Janssen, 1989; Koutsoubas *et al.*, 1992; 2000); Libya (Sturany, 1896); Cyclades (Sturany, 1896); Rhodes (Zenetos & Van Aartsen, 1995); Cyprus (Demetropoulos, 1971; Hadjichristophorou *et al.*, 1997); Israel (Haas, 1951; Barash & Danin, 1982, 1992).

Material examined.- 94A7 (1); 95A7 (1); 96A1 (2); 99H20 (1); juvenile, living specimens.

Cardiomyia costellata (Deshayes, 1835)

Neaera costellata Sturany, 1896:16.

Distribution.- Atlantic-Mediterranean. Crete (Forbes, 1844; Jeffreys, 1883; Jeffreys in Carus, 1893; Janssen, 1989; Koutsoubas *et al.*, 1992; 2000); Cyclades (Forbes, 1844); Asia Minor (Forbes, 1844); Libya (Sturany, 1896); Rhodes (Zenetos & Van Aartsen); Cyprus (Demetropoulous, 1971); Eratosthenes seamount (Galil & Zibrowius, 1998); Israel (Haas, 1951; Barash & Danin, 1982, 1992; Janssen, 1989).

Material examined.- 94H5 (7); 94H6 (3); 94H15 (6); 94H16 (15);

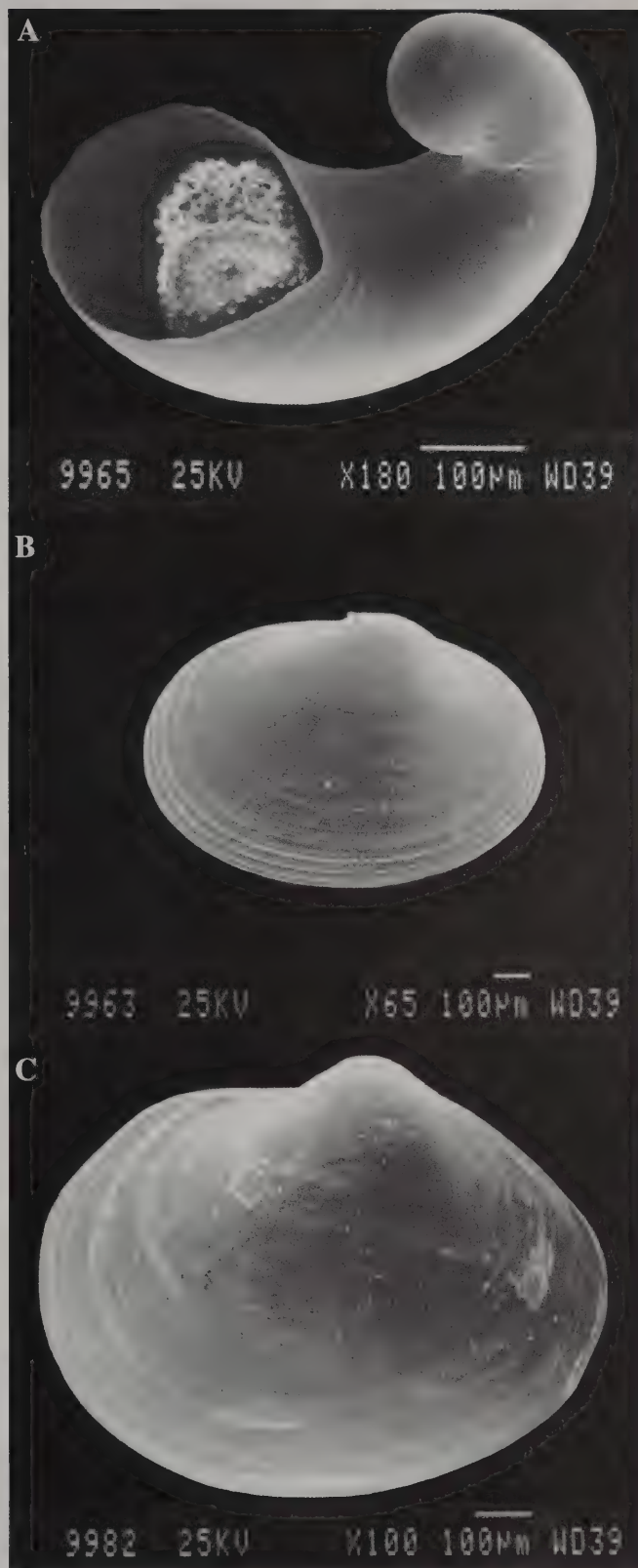



Plate 4. *Gleba cordata* Forskål, 1776. A. x 180; *Yoldia micrometrica* (Seguenza, G., 1877). B. x 65; *Thyasira oblonga* (Monterosato, 1878), C. x 100.

94H19 (3); 94A1 (3); 94A4 (6); 94A5 (3); 94A6 (5); 95A1 (3); 95A4 (6); 95A6 (6); 95HF1 (3); 95HF2 (3); 95HF3 (1); 95HF4 (2); 95HF6 (1); 95HF7 (1); 95HF8 (9); 95HF9 (3); 95HA (4); 95H4 (6); 95H13 (3); 95H15 (4); 95H19 (10); 95H20 (5); 96A1 (3); 96A2 (3); 96A3 (2); 96A4 (4); 96A5 (5); 96A6 (3); 96HA (1); 96H4 (9); 96H6 (12); 96H14 (5); 96H20 (7); 97H7 (10); 97H13 (3); 97H14 (1); 97H19 (3); 97H21 (4); 97H51 (3); 97H52 (6); 97HF2 (2); 97HF6 (1); 97HF7 (2); 97HF8 (3); 97HF9 (2); 98H4 (3); 98H15 (35); 98H19 (7); 98H20 (1); 98H22 (2); 98H23 (5); 98H24 (2); 98H26 (3); 98H27 (6); 98H28 (3); 99A1 (6); 99A3 (1); 99A4 (12); 99A5 (7); 99A6 (2); 99A7 (6); 99H4 (8); 99H7 (19); 99H15 (19); 99H19 (17); 99H20 (22); 99H21 (2); 99H23 (12); 99H24 (6); 99H25 (6); 99H27 (8); 99H29 (2). A total of 437 living specimens, all juveniles.

Scaphopoda Bronn, 1862
Gadilida Starbogatov, 1982
Entalinidae Chistikov, 1979
Entalina tetragona (Brocchi, 1814)
Dentalium quinquaulae Forbes, 1844:188.
Siphonodentalium quinquangulare Sturany, 1896:34.
Distribution.- Atlantic-Mediterranean. Aegean Sea (Vamvakas, 1971); Crete, (Forbes, 1844; Jeffreys, 1883; Sturany, 1896; Janssen, 1989); Cyclades (Forbes, 1844); Asia Minor (Forbes, 1844); Israel (Haas, 1951; Janssen, 1989; Barash & Danin, 1992).
Material examined.- 94H5 (2); 94H19 (7); 95HF2 (6); 95HF8 (9); 95HA (11); 95H4 (5); 95H7 (1); 95H13 (3); 95H14 (2); 95H15 (8); 95H19 (9); 95H20 (3); 96A1 (15); 96A4 (1); 96A5 (4); 96A6 (1); 96HA (48); 96H4 (13); 96H6 (13); 96H14 (4); 96H20 (14); 97H7 (3); 97H13 (1); 97H14 (20); 97H19 (3); 97H21 (31); 97H51 (2); 97H52 (28); 97HF1 (18); 97HF2 (4); 97HF3 (7); 97HF4 (1); 97HF7 (3); 97HF8 (8); 97HF9 (32); 98H4 (4); 98H7 (1); 98H15 (4); 98H19 (5); 98H20 (11); 98H21 (4); 98H22 (7); 98H23 (3); 98H24 (4); 98H25 (19); 98H26 (5); 98H27 (14); 99A1 (2); 99A4 (4); 99A5 (1); 99A6 (11); 99A7 (2); 99H4 (6); 99H7 (1); 99H15 (1); 99H19 (8); 99H20 (11); 99H21 (3); 99H23 (3); 99H25 (3); 99H27 (6); 99H28 (1); 99H29 (1). A total of 485 living specimens, 60% juveniles.

DISCUSSION

Much of the material examined consists of juvenile specimens and empty shells – only 23 of the 42 species collected were represented by living specimens, 11 of these were represented solely by juvenile specimens. Though an established method of collecting suprabenthic crustaceans, mainly percarids, from the deep sea (Cartes & Sorbe, 1993, 1997), the use of a plankton net attached to a deep-water trawl may affect the components and size of the biota sampled, so that full-sized live molluscan specimens may be undercollected. However, Di Geronimo (1974) found that in a sample collected by dredge at 1500 m *"non sono stati raccolti esemplari viventi"*, and that other samples *"è constituta da individui giovani o addirittura solo dalla protoconca"* (Di Geronimo, 1974). Janssen (1989), whose material was collected both by beam-trawl and box-core, stated that *"all true deepwater species are represented by shells only"*.

The deep waters of the eastern Mediterranean are separated from the Atlantic Ocean by the Gibraltar and Sicilian straits, yet the most common benthic molluscs in depths greater than 1000 m off the Israeli coast are the Atlanto-Mediterranean and Boreal *Yoldia micrometrica, Kelliella abyssicola, Cardyomia costellata, Entalina tetragona, Benthomangelia macra, Benthonella tenella,* and *Bathyarca pectunculoides* present respectively in 83, 77, 76, 63, 59, 50 and 33 out of the 90 samples collected during our study. The same species were identified by Janssen (1989) in material sampled by boxcore at a station off the Israeli coast at 1217 m. *K. abyssicola, C. costellata, E. tetragona* and *B. pectunculoides* are eurybathic species with upper bathymetric range well within the circalittoral (>150 m), whereas both the more stenobathic *B. macra* and *B. tenella* have epipelagic larvae (Bouchet & Warén, 1979), enabling them to overcome the barrier posed by the shallow Gibraltar and Sicilian sills.
Bouchet & Taviani (1992) have suggested that much of the Mediterranean deep-sea fauna is made-up of non-reproducing pseudopopulations, whereas Di Geronimo *et al.* (2001), who studied the bathyal thanatocoenoses molluscs in the Southern Tyrrhenian Sea, propose that the deep Mediterranean benthos is composed of biogeographically autochthonous species. Since the populations of the most common benthic molluscs in depths greater than 1000 m off the Israeli coast are composed of both adult and juvenile specimens, and gravid benthic decapod crustaceans and fish were collected from the depths of the Levantine sea, our results support the "autochthonous" model (Galil & Goren, 1994; Goren & Galil, 1997; Fishelson & Galil, 2001).
"The floro-faunistic impoverishment of the eastern Mediterranean compared with the western Mediterranean richness in species is well documented" (Sarà, 1985), but on occasion inaccurate. Thus, Sarà's (1985) assertion *"Not one of the eight species of Pteropoda of the western Mediterranean reaches the eastern zone"* is erroneous – already Forbes (1844) described nine thecostomate species from the Aegean sea. In fact, 12 of the 13 thecosomate species known from the Mediterranean (Corselli & Grecchi, 1990) were collected in the present study off the coast of Israel. Sarà's error notwithstanding, the progressive faunistic decrease from west to east in the Mediterranean Sea has been more pronounced for the deep benthos than for the whole fauna (Fredj & Laubier, 1985). Indeed, the low-diversity, low-density Levantine deep water fauna is considered the poorest in the Mediterranean. Comparing extant benthic deep-water molluscs of the western with those of the eastern Mediterranean we find that species that are common in the western basin had not been found in the eastern.
Di Geronimo *et al.* (2001) believe the impoverishment of the deep fauna stems from the onset of the warm homothermy that led to the *"disappearance of most cold-stenothermic species…, and a drop in diversity and richness in general"*.
The deep homothermy, extreme oligotrophy, and high salinity prevent settlement by members of the stenothermic and stenohalinic Atlantic bathyal, as far as they were able to cross the Gibraltar and the Sicilian sills (Pérès, 1985). In addition, during the past 450 kyr eleven layers of organic-rich sediments (sapropels) have been deposited in the eastern Mediterranean, the most recent layer deposited between 9000 and 6000 years BP (Troelstra *et al.*, 1991; Jorissen *et al.*, 1993; Cheddadi & Rossignol-Strick,

Table 1. Data of sampling stations A- Atlit; H- Hadera; HF-Haifa

Station	coordinates		depth (m)	date
94H3	32°31'N	34°14'E	1336	December 1994
94H4	32°28'N	34°16'E	1290	December 1994
94H5	32°32'N	34°07'E	1374	December 1994
94H6	32°36'N	34°02'E	1456	December 1994
94H7	32°41'N	34°04'E	1482	December 1994
94H15	32°42'N	34°11'E	1439	December 1994
94H16	32°39'N	34°16'E	1403	December 1994
94H19	32°31'N	34°06'E	1390	December 1994
95A1	32°47'N	34°20'E	1437	January 1995
95A2	32°51'N	34°20'E	1454	January 1995
95A3	32°52'N	34°18'E	1487	January 1995
95A4	32°53'N	34°17'E	1503	January 1995
95A5	32°52'N	34°14'E	1533	January 1995
95A6	32°53'N	34°10'E	1558	January 1995
95A7	32°45'N	34°36'E	1012	January 1995
95HF1	32°59'N	34°34'E	1362	September 1995
95HF2	32°59'N	34°35'E	1337	November 1995
95HF3	32°57'N	34°37'E	1311	September 1995
95HF4	33°00'N	34°33'E	1384	September 1995
95HF5	33°00'N	34°28'E	1456	November 1995
95HF6	32°59'N	34°30'E	1433	September 1995
95HF7	33°00'N	34°41'E	1175	September 1995
95HF8	33°00'N	34°35'E	1345	November 1995
95HF9	33°01'N	34°28'E	1471	November 1995
95HA	32°30'N	34°11'E	1350	November 1995
95H4	32°29'N	34°15'E	1300	November 1995
95H7	32°40'N	34°11'E	1480	November 1995
95H13	32°41'N	34°11'E	1485	November 1995
95H14	32°38'N	34°15'E	1400	November 1995
95H15	32°40'N	34°14'E	1450	November 1995
95H19	32°31'N	34°7'E	1400	November 1995
95H20	32°32'N	34°18'E	1279	November 1995
95700	32°41'N	34.40'E	734	November 1995
96A1	32°46'N	34°20'E	1427	September 1996
96A2	32°54'N	34°22'E	1453	September 1996
96A3	32°50'N	34°17'E	1471	September 1996
96A4	32°52'N	34°17'E	1501	September 1996
96A5	32°52'N	34°14'E	1518	September 1996
96A6	32°54'N	34°15'E	1528	September 1996
96HA	32°31'N	34°12'E	1365	October 1996
96H4	32°30'N	34°17'E	1292	October 1996
96H6	32°39'N	34°02'E	1505	October 1996
96H14	32°40'N	34°11'E	1397	October 1996
96H20	32°30'N	34°06'E	1374	October 1996
97HF1	32°58'N	34°37'E	1299	September 1997
97HF2	32°59'N	34°33'E	1374	September 1997

Station	coordinates		depth (m)	date
97HF3	32°57'N	34°34'E	1349	September 1997
97HF4	32°59'N	34°33'E	1389	September 1997
97HF6	32°00'N	34°30'E	1434	September 1997
97HF7	32°57'N	34°40'E	1227	September 1997
97HF8	32°86'N	34°36'E	1313	September 1997
97HF9	32°1'N	34°28'E	1439	September 1997
97H7	32°41'N	34°3'E	1493	September 1997
97H1	32°41'N	34°10'E	1467	September 1997
97H14	32°40'N	34°13'E	1415	September 1997
97H19	32°33'N	34°4'E	1421	September 1997
97H21	32°29'N	34°17'E	1272	September 1997
97H51	32°27'N	34°4'E	1362	September 1997
97H52	32°30'N	34°19'E	1269	September 1997
98H4	32°29'N	34°15'E	1296	November 1998
98H7	32°40'N	34°2'E	1500	November 1998
98H15	32°41'N	34°13'E	1243	November 1998
98H19	32°33'N	34°3'E	1462	November 1998
98H20	32°31'N	34°3'E	1344	November 1998
98H21	32°27'N	34°15'E	1276	November 1998
98H22	32°30'N	34°2'E	1450	November 1998
98H23	32°28'N	34°2'E	1389	November 1998
98H24	32°29'N	34°3'E	1391	November 1998
98H25	32°25'N	34°6'E	1351	November 1998
98H26	32°27'N	34°16'E	1277	November 1998
98H27	32°29'N	34°19'E	1251	November 1998
98H28	32°25'N	34°5'E	1319	November 1998
99A1	32°47'N	34°21'E	1413	November 1999
99A3	32°51'N	34°17'E	1484	November 1999
99A4	32°51'N	34°16'E	1486	November 1999
99A5	32°52'N	34°15'E	1509	November 1999
99A6	32°53'N	34°13'E	1522	November 1999
99A7	32°53'N	34°10'E	1557	November 1999
99H4	32°31'N	34°17'E	1296	November 1999
99H7	32°41'N	34°3'E	1485	November 1999
99H15	32°41'N	34°13'E	1448	November 1999
99H19	32°33'N	34°4'E	1421	November 1999
99H20	32°31'N	34°5'E	1394	November 1999
99H21	32°29'N	34°16'E	1284	November 1999
99H23	32°31'N	34°58'E	1412	November 1999
99H24	32°28'N	34°4'E	1398	November 1999
99H25	32°26'N	34°4'E	1344	November 1999
99H26	32°30'N	34°18'E	1272	November 1999
99H27	32°27'N	34°18'E	1260	November 1999
99H28	32°25'N	34°5'E	1330	November 1999
99H29	32°25'N	34°2'E	1353	November 1999

1995), with upper depth limits quoted at 700 m (THUNELL *et al.*, 1984), 300 m (RHOLING & GIESKES, 1989), and 150 m in the north Aegean Sea (PERISSORATIS & PIPER, 1992). Sapropels contain microfossils of planktonic origin but benthic fossils are mostly absent (CASTRADORI, 1993; RHOLING, 1994), indicative of anoxic bottom waters. The recurring stagnant (dysoxic and anoxic) episodes resulted in a reduction, or even demise of deep bottom-living fauna unable to avoid extinction by adapting to shallower depth: *"Several species of deep-water ostracodes that are still common in the Western Mediterranean became extinct in the Eastern Mediterranean basin at the onset of early Holocene S1 sapropel deposition"* (VAN HARTEN, 1987). The epipelagic fauna was unhurt: 9 of the 12 thecosomate species collected in this work were recorded from cores dating to the upper and middle Pleistocene taken in the Ionian sea (GRECCHI, 1984). GEORGE & MENZIES (1968) and MENZIES (1973) believe that the bathyal bottoms of the Levant are still inhospitable, or even azoic, after the last sapropelic event. The Quaternary anoxic events, combined with the barrier posed by the shallow Siculo-Tunisian sill, and the basin's oligotrophy and homothermy provide a plausible explanation for the sparse and impoverished mollusc fauna in the Levantine bathyal.

ACKNOWLEDGEMENTS

This research was partially funded by the Israel Electric corporation. We gratefully acknowledge their generosity. We thank P. Bouchet (MNHN, Paris) for his comments on an earlier draft.

REFERENCES

AARTSEN VAN J.J., BARASH Al. & CARROZZA F., 1989. Addition to the knowledge of the Mediterranean Mollusca of Israel and Sinai. *Bollettino Malacologico*, Milano, 25(1-4): 63-76.

ALMOGI-LABIN A. & REISS L., 1977. Quaternary Pteropods from Israel. Holocene and Pleistocene Pteropods from the Mediterranean continental shelf and slope of Israel. *Revista Español de Micropaleontologia*, 9(1): 5-48, 10 pls.

BARASH AL. & DANIN Z., 1971. Opisthobranchia (Mollusca) from the Mediterranean waters of Israel. *Israel Journal of Zoology*, 20: 151-200.

BARASH AL & DANIN Z, 1982. Mediterranean Mollusca of Israel and Sinai: composition and distribution. *Israel Journal of Zoology*, 35: 86-118.

BARASH AL & DANIN Z., 1988. Marine Mollusca at Rhodes. *Israel Journal of Zoology*, 35: 1-74.

BARASH AL & DANIN Z, 1992. *Mollusca I. Annotated list of Mediterranean molluscs of Israel and Sinai*. Fauna Palaestina. The Israel Academy of Sciences and Humanities, Jerusalem. 405 pp, 372 figs.

BEDULLI D., CATTANEO-VIETTI R., CHEMELLO R., GHISOTTI R. & GIOVINE F., 1995. Gastropoda Opistobranchia, Divasibranchia, Gymnomorpha. In: MINELLI, A., RUFFO, S. & LA POSTA, S. (Eds): *Check-list delle specie della fauna italiana*, 15. Calderini, Bologna, 24 pp.

BERDUGO V. & KIMOR B., 1967. Cruise to the Eastern Mediterranean, Cyprus. Plankton reports. *Bulletin of the Sea Fisheries Research Station*, Israel, 45: 6-31.

BERMAN T., AZOV Y., SCHNELLER Y., WALLINE P. & TOWNSEND D.W., 1986. Extent, transparency, and phytoplankton distribution of the neritic waters overlying the Israeli coastal shelf. *Oceanologica Acta*, 9: 439-447.

BERMAN T., TOWNSEND D.W., EL-SAYED S.Z., TRESS G.C. & AZOV Y., 1984. Optical transparency, Chlorophyll and primary productivity in the Eastern Mediterranean near the Israeli coast. *Oceanologica Acta*, 7: 367-372.

BOGI C., CIANFANELLI S. & TALENTI E., 1989. La malacofauna dell'isola di Cipro. *Atti Prima Giornata di Studi Malacologici CISMA*: 187-214.

BOUCHET P. & TAVIANI M., 1992. The Mediterranean deep-sea fauna: Pseudopopulations of Atlantic species? *Deep Sea Research*, 39(2): 169-184.

BOUCHET P. & WARÉN A., 1979. Planktotrophic larval development in deep-water gastropods. *Sarsia*, 64: 37-40.

CARROZZA F., 1984. Microdoridae di Malacologia Mediterranea, contributo sesto. *Bollettino Malacologico*, Milano, 20(9-12): 219-226.

CARTES J.E. & SORBES J.C., 1993. Les communautés suprabenthiques bathiales de la mer Catalane (Méditerranée Occidentale): données preliminaries sur la répatition bathymétrique et l'abondance des crustacés pércarides. *Crustaceana*, 64(2): 155-171.

CARTES J.E. & SORBES J.C.., 1997. Bathyal cumaceans of the Catalan Sea (North-western Mediterranean): faunistic composition, diversity and near-bottom distribution along the slope (between 389 and 1859 m). *Journal of Natural History*, 31: 1041-1054.

CARUS J.V., 1893. *Prodromus Faunae Mediterraneae*, vol. II. Brachystomata, Mollusca, Tunicata. E. Schweizerbart, Stuttgart, 854 pp.

CASTRADORI D., 1993. Calcareous nannofossils and the origin of eastern Mediterranean sapropels. *Palaeoceanography*, 8: 459-471.

CECALUPO A. & GIUSTI F., 1989. Rinvenimenti malacologici a sud-ovest dell'isola di Capraia (LI). Parte II. *Bollettino Malacologico*, Milano, 25(1-4): 97-109.

CECALUPO A.. & QUADRI P., 1996. Contributo alla conoscenza malacologica per il nord dell'Isola di Cipro. *Bollettino Malacologico*, Milano, 31(5-8): 95-118.

CHEDDARI R., & ROSSIGNOL-STRICK M., 1995. Improved preservation of organic matter and pollen in Eastern Mediterranean sapropels. *Palaeoceanography*, 10: 301-309.

CORSELLI C. & GRECCHI G., 1987. Considerazioni su una popolazione di *Cavolinia gibbosa gibbosa* del Mediterraneo Orientale. *Bollettino Malacologico*, Milano, 23(1-4): 83-91.

CORSELLI C. & GRECCHI G., 1990. Considerazioni sui Thecosomata attuali del Bacino Mediterraneo. *Lavori S.I.M. Atti del Congresso di Parma*, 24: 91-105.

DEMETROPOLUS A., 1971. Marine mollusks of Cyprus. Part B. Bivalvia. *Fisheries Bulletin*, 3: 1-24.

DI GERONIMO I., 1974. Molluschi bentonici in sedimenti recenti batiali e abissali dello Jonio. *Conchiglie*, 10(7-8): 133-172.

DI GERONIMO I, ROSSO A., LA PERNA R., & SANFILIPO, R., 2001. Deep-sea (250-1,550 m) benthic thanatocoenoses from the Southern Tyrrhenian Sea. In: FARANDA F.M., GUGLIELMO L. & SPEZIE G., (eds.) *Mediterannean Ecosystems: structures and Processes*. Springer-Verlag, Italia: 277-287.

FISHELON L. & GALIL B. S., 2001. Gonad structure and reproductive cycle in the deep-sea hermaphrodite tripodfish, *Bathypterois mediterraneaus* (Chlorophthalmidae, Teleostei). *Copeia* (2): 556-560.

FORBES E., 1844. *Report on the Mollusca and Radiata of the Aegean Sea, and on their distribution, considered as bearing on Geology.* Report of the 13th Meeting of the British Association for the advancement of Science. John Murray, London. pp. 130-193.

FREDJ G. & LAUBIER L., 1985. The deep Mediterranean benthos. In MORAITOU-APOSTOLOPOULOU M. & V. KIORTOSIS (Eds): *Mediterranean Marine Ecosystems*. NATO Conference Series, Plenum Press, New York, London. pp. 109-145.

GALIL B. S. & GOREN M., 1994. The deep sea Levantine fauna – new records and rare occurrences. *Senckenbergiana maritima*, 25(1/3): 41-52.

GALIL B. S. & ZIBROWIUS H., 1998. First benthos samples from Eratosthenes seamount, Eastern Mediterranean. *Senckenbergiana maritima*, 28(4/6): 111-121.

GEORGE R.Y. & MENZIER R.J., 1968. Additions to the Mediterranean deep-sea fauna. *Revue roumaine de Biologie,* 13: 367-383.

GIRIBET G. & PENAS., 1997. Fauna malacologica del litoral del Garraf (NE de la Peninsula Iberica). *Iberus*, 15(1): 41-93.

GOFAS S. & WARÉN A., 1982. Taxonomie de quelque espèces du genre Alvania (Mollusca, Gastropoda) des côtes ibériques et marocaines. *Bollettino Malacologico*, Milano, 18(1-4): 1-16.

GOREN, M. & GALIL B. S., 1997. New records of deep-sea fishes from the Levant Basin and a note on the deep-sea fishes of the Mediterranean. *Israel Journal of Zoology*, 43: 197-203.

GRECCHI G., 1984. Molluschi planctonici e bentonici in sedimenti sapropelitici del quaternario della dorsale mediterranea. *Bollettino Malacologico*, Milano, 20(1-4): 1-34.

HAAS G., 1951. Preliminary report on the Molluscs of the Palestine coastal shelf. *Bulletin of the Sea Fisheries Research Station, Israel*, 1: 1-20.

HADJICHRISTOPHOROU M., ARGYROU M., DEMETROPOULOS A. & BIANCHI T., 1997. A species list of the sublittoral soft-bottom macrobenthos of Cyprus. *Acta Adriatica*, 38(1): 3-32.

HECHT A., PINARDI N. & ROBINSON A.R., 1988. Currents, water masses, eddies and jets in the Mediterranean Levantine Basin. *Journal of Physical Oceanography*, 18: 1320-1353.

HIEKE W., HALBACH P., TURKAY M. & WEIKERT H., 1994. Mittelmeer 1993, cruise No. 25 12 May-20 August 1993. *Meteor Berichte*, 94-3: 1-243.

JANSENN R., 1989. Benthos-Mollusken aus dem Tiefwasser des östlichen Mittelmeeres, gesammelt während der "METEOR"- Fahrt 5 (1987). *Senckenbergiana maritima*, 20(5/6): 265-276.

JEFFREYS J.G., 1879. On the Mollusca procured during the 'Lightening' and 'Porcupine' Expedition, 1868-70. part II. *Proceedings of the Zoological Society* (London), 553-588.

JEFFREYS J.G., 1881a. On the Mollusca procured during the 'Lightening' and 'Porcupine' Expedition, 1868-70. part III. *Proceedings of the Zoological Society* (London), 693-724.

JEFFREYS J.G.,1881b. On the Mollusca procured during the 'Lightening' and 'Porcupine' Expedition, 1868-70. part IV. *Proceedings of the Zoological Society* (London), 922-952.

JEFFREYS J.G., 1883. Mediterranean Mollusca. No 3, and other Invertebrata. *Annals and Magazine of Natural History*, 5(11): 393-401.

JORISSEN F.J., ASIOLI A., BORSETTI A.M., CAPOTONDI L., VISCHER J.P. DE, HILGENF.J., VAN DER BORG K., VERGNAUD-GRAZZINI C. & ZACHARIASSE W.J., 1993. Late Quaternary central Mediterranean biochronology. *Marine Micropaleontology*, 21: 169-189.

KARAKASSIS J., 1991. *Contribution to the knowledge of the benthic ecosystem of the continental shelf of Crete.* Ph.D. thesis, University of Crete, 195 pp.[in Greek].

KIORTOSIS V., 1969. Marine fauna of the Aegean Sea. Surface zooplankton from the North Aegean Sea. Final Report for the Office of Naval Research, Oceanic Biology Branch.

KOUTSOUBAS D. &. KOUKOURAS A., 1993. An account of our knowledge on the opisthobranch mollusk fauna of the Aegean Sea. *Bollettino Malacologico*, Milano, 29(5-8): 191-200.

KOUTSOUBAS D. &. KOUKOURAS A., KARAKAKIS I. & DOUNAS C., 1992. Contribution to the knowledge of Gastropoda and Bivalvia (Mollusca) of Crete Island (S. Aegean Sea). *Bollettino Malacologico*, Milano, 28(1-4): 69-82.

KOUTSOUBAS D. &. KOUKOURAS A.. & VOULTSIASDOU-KOUKOURA E., 1997. Prosobranch mollusk fauna of the Aegean Sea: new information, checklist, distribution. *Israel Journal of Zoology*, 43: 19-54.

KOUTSOUBAS D., TSELEPIDES A. &. ELEFTHERIOU A., 2000. Deep sea molluscan fauna of the Cretan Sea (Eastern Mediterranean): faunal, ecological and zoogeographical remarks. *Senckenbergiana Maritima*, 30(3/6): 85-98.

KROM M.D., KRESS N., BRENNER S. & GORDON L.I., 1991. Phosphorus limitation of primary productivity in the Eastern Mediterranean. *Limnological Oceanography*, 36: 424-432.

MENZIES R.J., 1973. Biological history of the Mediterranean sea with reference to the abyssal benthos. *Rapports et Proces-Verbaux des reunions, Commission Internationale pour l'exploration scientifique de la mer Méditerranée*, 26(9): 717-723.

MORAITOU-APOSTOLOPOULOU M., 1985. The zooplankton communities of the eastern Mediterranean (Levantine Basin, Aegean Sea); influence of man-made factors. In: MORAITOU-APOSTOLOPOULOU M., & V. Kiortsis (EDS): *Mediterranean Marine Ecosystems*. NATO Conference Series, New York, London. Plenum Press: 303-331.

PARENZAN P., 1976. *Carta d'identita delle conchiglie del Mediterraneo.* Vol. II. Bivalvi, seconda parte. Bios Taras, Taranto: 283-546.

PASTOURET L., 1970. Étude sédimetologique et paléoclimatique de carotes prélevées en Méditerranée Orientale. *Téthys*, 2(1): 227-266.

PÉRÈS J. M., 1985. History of the Mediterranean biota and the colonization of the depths. In MARGALEF, R (Ed): *Key Enviroments Western Mediterranean*. Oxford, New York, Pergamon Press: 198-232.

PERISSORATIS C. & PIEPER D.J.W., 1992. Age, regional variation and shallowest occurrence of S1 sapropel in the northern Aegean Sea. *Geo-Marine Letters,* 12: 49-53.

RAMPAL J., 1970. Ptéropodes Thècosomes indicateurs d'eau d'origine orientale en Méditerranée. *Journées d'Étude Planctonologiques*, CIESM, Monaco: 49-52.

RAMPAL J., 1975. *Les Thècosomes (Mollusques pèlagiques). Systematiques et evolution-écologie et biogeography Méditerranéennes.* These présente a l'Universite de Provence, 485 pp.

RHOLING E.J., 1994. Review and new aspects concerning the formation of eastern Mediterranean sapropels. *Marine Geology*, 122: 1-28.

RHOLING E.J., & GIESKES W.W.C., 1989. Late Quaternary changes in Mediterranean intermediate water density and formation rate. *Paleoceanography*, 4: 531-545.

SARÀ M., 1985. Ecological factors and their biogeographic consequences in the Mediterranean ecosystems. In: MORAITOU-APOSTOLOPOULOU M. & V. KIORTOSIS (Eds): *Mediterranean Marine Ecosystems*. NATO Conference Series, New York, London. Plenum Press: 1-17.

STURANY R., 1896. Berichte der Commission für Tiefsee- Forschungen. XVIII. Zoologische Ergebnisse. VII. Mollusken I. (Prosobranchier und Opisthobranchier; Scaphopoden; Lamellibranchier) gesammelt von S. M. Schiff "Pola" 1890-1894. *Denkschriften der Akademie der Wissenschaften,* Wien 63: 36 pp., pls 1-2.

TENEKIDIS N.S., 1989. *A collection of shells from the Greek Seas*. Protopapa Press, Athens: 188 pp.

THUNELL R.C., WILLIAMS D.F. & BELYEA P.R., 1984. Anoxic events in the Mediterranean Sea in relation to the evolution of late Neogene climates. *Marine Geology*, 59: 105-134.

TORNARITIS G., 1987. *Mediterranean sea shells Cyprus*. Nicosia: 190 pp.

TROELSTRA S.R., GANSSEN G.M., VAN DER BORG K., & DE JONG A.F.M., .1991. A late Quaternary stratigraphic framework for Eastern Mediterranean sapropel S1 based on AMS 14C dates and stable oxygen isotopes. *Radiocarbon*, 33: 15-21.

VAN HARTEN D., 1987. Ostracodes and the early Holocene anoxic event in the Eastern Mediterranean – evidence and implications. *Marine Geology*, 75: 263-269.

VAMVAKAS C., 1971. Peuplements benthiques des substrats meubles du sud de la Mer Egée. *Tethys*, 2(1): 89-129.

VATOVA A., 1974. Sui molluschi di alcuni saggi di fondo prelevati alle soglie del Mar Jonio. *Conchiglie*, 10(5-6): 93-112.

WARÉN A., 1992. New and little known "skeneimorph' gastropods from the Mediterranean Sea and the adjacent Atlantic Ocean. *Bollettino Malacologico*, Milano, 27(10-12): 149-248.

WARÉN A., GOFAS S. &. SCHANDER CH., 1993. Systematic position of three European heterobranch gastropods. *The Veliger*, 36(1): 1-15.

YACOBI Y.Z., ZOHARY T., KRESS N., HECHT A., ROBARTS R.D., WAISER M., WOOD, A.M. & LI W.K.W., 1995. Chlorophyll distribution throughout the southeastern Mediterranean in relation to the physical structure of the water mass. *Journal of Marine Systems*, 6: 179-190

YILMAZ A. & TUGRUL S., 1998. The effect of cold- and warm-core eddies on the distribution and stoichometry of dissolved nutrients in the northeastern Mediterranean. *Journal of Marine Systems,* 16: 253-268

ZENETOS A. & VAN AARTSEN J. J., 1995. The deep sea molluscan fauna of the S.E. Aegean Sea and its relation to the neighbouring faunas. *Bollettino Malacologico*, Milano, 30(9-12): 253-268.

Lavoro accettato il 22 Giugno 2002

A new species of *Ersilia* (Caenogastropoda, Eulimidae) from the Plio-Pleistocene of the central Mediterranean area

Vittorio Garilli

KEY WORDS: Mollusca, Gastropoda, Eulimidae, Taxonomy, Pliocene, Pleistocene, Italy, Greece.

ABSTRACT A new species of the genus *Ersilia* Monterosato, 1872 (Caenogastropoda, Eulimidae), *E. aliceae* n. sp., is described from the Pliocene (Lazio, Central Italy) and Pleistocene (W Sicily, Italy and NW Peloponnesus, Greece) of the central Mediterranean area. This is the first finding of the genus *Ersilia* for the Plio-Pleistocene. It is compared with the living *E. mediterranea* (Monterosato, 1869) and *E. stancyki* Warén, 1980, and with the fossil *E. oligocaenica* Lozouet, 1999. *E. aliceae* n. sp. closely resembles *E. mediterranea*, from which it mainly differs by having less numerous spiral lines and rounded teeth on the outer lip. Furthermore, *E. aliceae* n. sp. has a multispiral protoconch suggesting a planktotrophic larval development, while *E. mediterranea* has a paucispiral protoconch suggesting a non-planktotrophic development.

RIASSUNTO Viene descritta una nuova specie fossile del genere *Ersilia* Monterosato, 1872 (Caenogastropoda, Eulimidae), *E. aliceae* n. sp., ritrovata nel Pliocene dell'Italia centrale (Magliano Sabina, Roma) e nel Pleistocene siciliano (Monte Serro, Sicilia occidentale) e greco (Killini, Peloponneso nord-occidentale). Si tratta della seconda specie fossile nota per il genere *Ersilia*, conosciuto dall'Oligocene superiore con la specie *E. oligocaenica* Lozouet, 1999, e della prima segnalazione nel Plio-Pleistocene. La specie è morfologicamente affine all'unico rappresentante vivente segnalato in Mediterraneo, *E. mediterranea* (Monterosato, 1869), dal quale differisce per avere linee spirali più incise e meno numerose (5-7 contro le 10-15 della specie vivente) e per la presenza di piccòli denti tubercoliformi sul labbro esterno. Inoltre, le protoconche delle due specie, multispiralata nella specie fossile (2.2-2.5 giri, altezza 260-315 µm, larghezza 220-250 µm, diametro del nucleo 40-50 µm) e paucispiralata in quella vivente (1.3-1.5 giri, altezza 210-220 µm, larghezza 250-280 µm, diametro del nucleo 70-75 µm), indicherebbero uno sviluppo larvale differente: planctotrofico in *E. aliceae* n. sp. e non-planctotrofico in *E. mediterranea*. *E. aliceae* n. sp. viene confrontata anche con la specie atlantica *E. stancyki* Warén, 1980 e con quella fossile *E. oligocaenica*.

V. GARILLI, Via Alla Falconara, 34 - 90136 Palermo, e-mail: nenti@tiscalinet.it

INTRODUCTION

Eulimid gastropods are a common component in Tertiary and Quaternary mollusc associations. Nevertheless, the only fossil record (LOZOUET, 1999) for the eulimid genus *Ersilia* is *Ersilia oligocaenica* Lozouet, 1999, from the French Upper Oligocene. This genus, described by MONTEROSATO (1872: 33) as a Lacunidae, was definitively attributed to Eulimidae by WARÉN (1980). Two living species belonging to *Ersilia* are known: *Ersilia mediterranea*, described by MONTEROSATO (1869: 15, fig. 8) as *Lacuna mediterranea* from the Mediterranean Sea, and *E. stancyki* Warén, 1980 from the Western Atlantic.

A study on the malacofaunas from the Lower Pleistocene of Monte Serro (Dattilo, Western Sicily) allowed the finding of a specimen belonging to the genus *Ersilia*. This specimen was erroneously identified as *E.* cfr. *mediterranea* (Monterosato) by GARILLI (1998, see this reference also for the associated molluscan fauna). Later, two specimens of *Ersilia* sp. from the Pleistocene of Killini (North Western Peloponnesus, Greece) and from the Pliocene of Magliano Sabina (Roma, Central Italy) (see TUCCIMEI, 1880, for age and associated molluscan fauna) were sent to me by Stefano Palazzi. These specimens showed some original morphological features which are not present in other congeneric or similar recent and fossil eulimids, and thus a new species is described on this material in the present work.

SYSTEMATICS

Classis Gastropoda Cuvier, 1797

Ordo Neotaenioglossa Haller, 1882

Familia Eulimidae H. & A. Adams, 1853

Genus *Ersilia* Monterosato, 1872

Ersilia aliceae n.sp.

Pl. 1, Figs 1-5, 8-10.

TYPE MATERIAL

Holotype (H 1.5 mm, D 0.8 mm, Pl. 1, Figs 1, 2, 7, 8), from the Lower Pleistocene of Monte Serro (Dattilo, Trapani, Western Sicily), Museo Geologico G.G. Gemmellaro, Palermo, Italy (DATP 001/2971).

Paratype 1 (H 1.2 mm, D 0.7 mm, Figs 3, 4, 10), from the Pleistocene of Killini (Elea, North-Western Peloponnesus, Greece), Goulandris Natural History Museum, Kifissia, Greece (17/5).

Paratype 2 (H 2.0 mm, D 1.0 mm, Figs 5, 9), from the Pliocene of Magliano Sabina (Roma, Central Italy), Museo Zoologico, Bologna, Italy (MZB 40001).

DERIVATIO NOMINIS

The species is named after my daughter Alice.

DESCRIPTION

Small, rather sturdy, ovate, moderately inflated shell reaching 2 mm in height (paratype 2). Protoconch conical, multispiral consisting of 2.2-2.5 whorls (according to VERDUIN's, 1977 method), sculptured by curved, opisthocyrt axial lines reaching from suture to suture. Protoconch height 315, 310 and 260 µm

respectively in paratype 2, holotype and paratype 1; width 250 µm in holotype and paratype 2 and 220 µm in paratype 1; nucleus diameter 40-50 µm. Protoconch/teleoconch boundary well marked by a slightly sinuated scar. Teleoconch consisting of 2, 2.2 and 2.7 (respectively in paratype 1, holotype and paratype 2) convex whorls rapidly growing in height, sculptured by narrow, incised spiral lines numbering 5 (paratype 1) to 7 (holotype and paratype 2) in the penultimate whorl and by moderately curved, prosocyrt growth lines. Spiral lines, under magnification higher than 40-50x, looking like a fine chain being run across by very small, irregular and narrow axial ribs, lacking on the remaining surface, and having strongly indented borders. Sutures inclined and incised. Body whorl well developed, making up about 3/4 of shell height. Aperture semicircular and broad, making up about 3/4 (2/3 in paratype 2) of body whorl height and about 1/2 of total height. Outer lip rounded, slightly retracting in its lower portion, with small rounded tubercles, mainly occurring on the central part of lip (tubercles have been observed in paratype 1 which is the only specimen with a well preserved outer lip). Columella broader and flattened towards the lowermost part, with a small umbilical chink which can be partly covered by a callus (paratype 2).

LOCUS TYPICUS

Monte Serro, Dattilo, Trapani, Western Sicily (Fig. 1), Foglio 257 IV NE (Dattilo) of Carta d'Italia (I.G.M., 1971), UTM: 33S TC 899 068.

STRATUM TYPICUM

The holotype is from a bulk sample collected at about 70 cm from the base of a yellowish silt-sandy bed Lower Pleistocene (Emilian) in age, about 1 m thick, cropping out in the south western side of Monte Serro, 170 m above sea-level (see GARILLI, 1998 for the age and the position in a geological log of the outcrop).

STRATIGRAPHICAL DISTRIBUTION

This species is known only from the Pliocene and Pleistocene of the central Mediterranean area.

PALEOECOLOGICAL OBSERVATIONS

According to the available data, all the living eulimids are parasitic in or on echinoderms (BOUCHET & WARÉN, 1986; WARÉN 1980, WARÉN & LEWIS, 1994). In particular, the species *E. mediterranea* (Monterosato) and *E. stancyki* Warén, have respectively been found on the ophiuroids *Ophioderma longicauda* (Retzius, 1805) (MIFSUD, 1995) and *Ophiolepis elegans* (Lütken, 1859) (WARÉN, 1980).

The mollusc assemblages from Monte Serro (GARILLI, 1998) and Killini (under study) are characterised by the abundance of *Bittium latreillii* (Payraudeau, 1826), *B. reticulatum* (Da Costa, 1778), *Tricolia* spp., trochids (especially *Jujubinus* spp.), rissoids, mainly *Alvania cimex* (Linneo, 1758) and *A. geryonia* (Nardo, 1847 ex Chiereghini ms.), indicative of a shallow-water depositional setting. In particular, the Monte Serro malacofauna was referred by GARILLI (1998) to an ecotone between the "Sables Vaseaux superficiels en Mode Calme" (SVMC) and the "Herbiere de Posidonies" (HP) biocoenoses (*sensu* PÉRÈS & PICARD, 1964). Paratype 2 (Pliocene of Magliano Sabina) is from a *Cladocora* Ehrenberg, 1834 yellow sandy level (S. PALAZZI, pers. comm., 2000).

Paleoclimatically, it is worth remarking the occurrence of the termophilic gastropod *Jujubinus* (?) *bullula* (P. Fisher, 1877) (see RUGGIERI & UNTI, 1988, for interesting consideration about this species) in the Monte Serro and Killini assemblages, suggesting warm-temperate water conditions.

Fig.1 - Location of type locality. The shaded square indicates the fossiliferous bed of Mt. Serro.

Fig.1 - Localizzazione della località tipo. Il quadratino pieno indica l'affioramento fossilifero di Monte Serro.

REMARKS

E. aliceae n. sp. closely resembles *E. mediterranea* (Monterosato) (Pl. 1, Fig. 6) from which it differs in having less numerous and more incised spiral lines (5-7 *vs.* 10-15 in the penultimate whorl), a less globose shell shape and well defined and rounded teeth on the outer lip (Pl. 1, Fig. 4). Furthermore, *E. aliceae* n. sp. has a multispiral, conical protoconch (Pl. 1, Figs 8-10), with a small nucleus, suggesting a planktotrophic larval development, while *E. mediterranea* has a blunt apex (pl. 1 Fig. 11) with a paucispiral protoconch (width 250-280 µm, height 210-220 µm, nucleus 70-75 µm) consisting of 1.3 to 1.5 whorls suggesting a non-planktotrophic development.

E. aliceae n. sp. is also similar to the Western Atlantic species *E. stancyki* Warén (WARÉN 1980, figs 12, 13) which substantially has a more slender shell, a completely smooth protoconch, a proportionally higher aperture (WARÉN, pers. comm., 1999), a different teleoconch sculptural pattern and no teeth on the outer lip. *E. aliceae* n.sp. is also different from *E. oligocaenica* Lozouet, which has a smooth outer lip, a closer-set sculpture of small

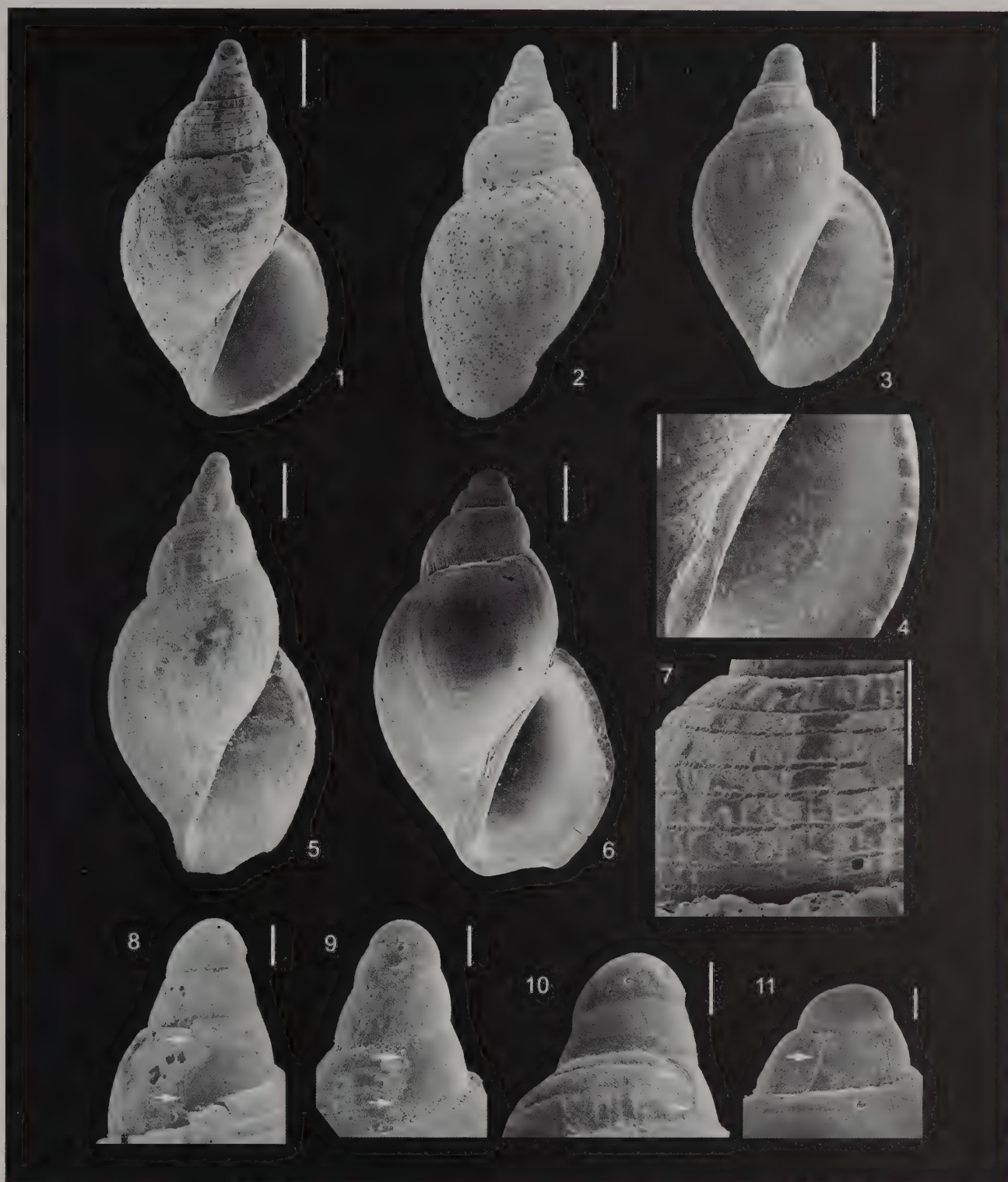



Plate 1: Figs 1, 2, 7, 8-*Ersilia aliceae* n. sp., holotype, Monte Serro, Dattilo, W Sicily, Lower Pleistocene; apertural view (1), dorsal view (2), sculpture of the first teleoconch whorl (7) and protoconch (8). **Figs 3, 4, 10**-*Ersilia aliceae* n. sp., paratype 1, Killini, NW Peloponnesus, Greece, Pleistocene; apertural view (3), particular of aperture (note the umbilical chink and the small teeth on the outer lip) (4) and protoconch (10). **Figs 5, 9**-*Ersilia aliceae* n. sp., paratype 2, Magliano Sabina, Roma, Central Italy, Pliocene; ventral view (5) and protoconch (9). **Figs 6, 11**-*Ersilia mediterranea*, Marina di Cinisi, Palermo, NW Sicily; apertural view (6) and protoconch (11). White arrows indicate protoconch/teleoconch boundary. Scale bars: 250 µm in Figs. 1, 2, 3, 5, 6; 100 µm in Figs. 4, 7; 80 µm in Fig. 10 and 60 µm in Figs 8, 9, 11.

Tavola 1: Figg. 1, 2, 7 ,8 *Ersilia aliceae* n. sp., olotipo, Monte Serro, Dattilo, Sicilia occidentale, Pleistocene inferiore; vista frontale (1), vista dorsale (2), scultura del primo giro di teleoconca (7) e protoconca (8). **Figg. 3, 4, 10** *Ersilia aliceae* n. sp., paratipo 1, Killini, Peloponneso nord occidentale, Grecia, Pleistocene; vista frontale (3), particolare dell'apertura (notare la fessura dell'ombelico e i piccoli denti sul labbro esterno) (4) e protoconca (10). **Figg. 5, 9** *Ersilia aliceae* n. sp., paratipo 2, Magliano Sabina, Roma, Italia centrale, Pliocene; vista frontale (5) e protoconca (9). **Figg. 6, 11** *Ersilia mediterranea*, Marina di Cinisi, Palermo, Sicilia nord occidentale; vista frontale (6) e protoconca (11). Le frecce bianche indicano il limite protoconca/teleoconca. Scala di riferimento: 250 µm in Figg. 1, 2, 3, 5, 6; 100 µm in Figg. 4, 7; 80 µm in Fig. 10 e 60 µm in Figg. 8, 9, 11.

dimples arranged in spiral lines, a more slender shell shape and a narrower aperture (LOZOUET, 1999, pl. 9, figs 8, 9; pl. 20, fig. 12).

Too many gaps in the paleontological record preclude any phylogenetic inference about *E. aliceae* n. sp., *E. mediterranea* (1) and the oldest European representative *E. oligocaenica*.

ACKNOWLEDGEMENTS

I am very grateful to Luca Galletti (Monreale) for help in collecting the material from Monte Serro, to Pierre Lozouet (Museum National d'Histoire Naturelle, Paris) for bibliographic help, to Costantine Mifsud (Rabat, Malta) for helpful discussion, to Stefano Palazzi (Modena) for providing material and comments and to Anders Warén (Swedish Museum of Natural History, Stockholm) for encouragement and discussions. S. Palazzi and A. Warén also critically read to the manuscript. My thanks also to Sergio Bonomo (Dipartimento di Geologia, Università di Palermo), Giuseppe Fustaino (S.I.R.A.m. s.r.l., Milazzo), Leo Genduso (Istituto di Entomologia Agraria, Università di Palermo), Saverio Guarino, Franco Italiano (S.I.R.A.m. srl, Milazzo), Anna Maria Mannino (Dipartimento di Scienze Botaniche, Università di Palermo), Renato Tonielli and Francesco Toscano (Istituto di Ricerca Geomare Sud, C.N.R., Napoli) for the help in SEM photographs. I am grateful to Rafael La Perna (Dipartimento di Geologia e Geofisica, Università di Bari), and to two reviewers, Carlos Marques da Silva (Universidade de Lisboa) and Paola Monegatti (Dipartimento di Scienze della Terra, Università di Parma), for the useful comments on the original manuscript.

REFERENCES

BOUCHET P. & WARÉN A., 1986. Revision of the Northeast Atlantic bathyal and abyssal Aclididae, Eulimidae, Epitonidae (Mollusca, Gastropoda). *Bollettino Malacologico*, Milano, Suppl. 2: 299-576.

CHIRLI C. & BOGI C., 2002. La malacofauna pliocenica di Poggio alla Fame presso Colle Val d'Elsa (Siena). Contributo I. *La Conchiglia* 134 (303): 18-22.

GARILLI V., 1998. Paleocomunità a molluschi bentonici nel Pleistocene inferiore di Dattilo (Trapani). Brevi considerazioni ecologiche e cronologiche. In LO CICERO G. (Ed.): *La Sicilia un laboratorio del Mediterraneo. Atti del 79° Congresso Nazionale della Società Geologica Italiana*. Palermo 21-23 settembre, 1998. Offset, Palermo. Vol. B: 471-474.

LOZOUET P., 1999. Nouvelles espèces de gastéropodes (Mollusca: Gastropoda) de l'Oligocène et du Miocène inférieur d'Aquitaine (sud-ouest de la France). Partie 2. *Cossmanniana*, Paris, 6 (1-2): 1-68.

MIFSUD C., 1995. *Ersilia mediterranea* (Monterosato, 1869) (Gastropoda, Eulimidae), un ectoparassita di *Ophioderma longicaudum* (Retzius, 1805), nelle Isole Maltesi. *La Conchiglia*, Roma, Anno XXVII (274): 4-6.

MONTEROSATO T.A. di, 1869. *Testacei nuovi dei mari di Sicilia*. Tipografia di Ignazio Mirto, Palermo, 18 pp.

MONTEROSATO T.A. di, 1872. *Notizie intorno alle conchiglie mediterranee*. Ufficio tipografico di Michele Amenta, Palermo, 61pp.

PÉRÈS J.M. & PICARD J., 1964. Nouveau manuel de bionomie benthique de la mer Méditerranée. *Recueil des Travaux de la station marine d'Endoume*, Marseille, 31 (47): 1-317.

RUGGIERI G. & UNTI M., 1988. Una malacofauna del Tirreniano di Birgi Nuovo (Trapani). *Il Naturalista Siciliano*, Palermo, S. IV, 12 (1-2): 19-32.

TUCCIMEI G.A., 1880. I colli pliocenici di Magliano Sabino. *Gli Studi in Italia*, Roma, 2: 3-21.

VERDUIN A. 1977. On a remarkable dimorphism of the apices in many groups of sympatric, closely related marine gastropod species. *Basteria*, Leiden, 41: 91-95.

WARÉN A., 1980. Descriptions of new taxa of Eulimidae (Mollusca, Prosobranchia) with notes on some previously described genera. *Zoologica Scripta*, Oslo, 9: 283-306.

WARÉN A. & LEWIS L.M., 1994. Two new species of eulimid gastropods endoparastic in asteroids. *The Veliger*, Berkeley, 37 (4): 325-335.

Lavoro accettato il 22 Luglio 2002

(1) While printing, *E. mediterranea* has been recorded for the Pliocene of Tuscany by CHIRLI & BOGI (2002). This record points out the Pliocene coexistence of *E. aliceae* n.sp. and *E. mediterranea*.

Bollettino Malacologico, Roma, **39** (5-8): 95-104, [2003] 2004 - Società Italiana di Malacologia

Nomenclature of the smaller Mediterranean *Cerithium* species

Serge Gofas, Vittorio Garilli & Marie-Catherine Boisselier-Dubayle

KEY WORDS: Cerithiidae, Mediterranean, taxonomy, lectotype designations.

ABSTRACT The Mediterranean morphotypes generally confused under the name *Cerithium rupestre* have been shown to belong to two different species. The correct name for one of the species, living in very shallow rocky areas including splashpools, is *Cerithium lividulum* Risso,1826, and for the other, usually living in the shallow infralittoral community of photophilous algae, *C. renovatum* Monterosato, 1884. Type material is figured for all nominal species in this species group introduced prior to 1900, and for some of the species proposed later. Orientations for future work in the taxonomy of this species group are suggested.

RIASSUNTO E' stato mostrato che le entità morfologiche generalmente confuse sotto il nome *Cerithium rupestre* appartengono a due specie distinte. I nomi corretti per questi taxa sono *Cerithium lividulum* Risso, 1826, per la specie vivente su fondali rocciosi in acque più superficiali dell'infralitorale superiore e nelle pozze di marea, e *Cerithium renovatum* Monterosato, 1884, per la specie solitamente vivente su fondali infralitorali ricoperti da alghe fotofile. *Cerithium lividulum* ha una conchiglia robusta con giri appena convessi, coste assiali talora tuberculate e cordoni spirali piani. La colorazione è data da screziature bruno-verdastre decorrenti spiralmente su uno sfondo bianco. La conchiglia di *Cerithium renovatum* è più piccola (inferiore ai 20 mm nel materiale esaminato), più delicata e snella, e presenta una serie regolare di tubercoli, costantemente di colore bianco, che iniziano nei primi giri e raggiungono il loro massimo sviluppo in corrispondenza del penultimo. *Cerithium renovatum* non mostra coste assiali evidenti. Le ovature delle due specie, deposte in acquario, sono differenti. Relativamente a questi taxa, viene illustrato il materiale tipo di tutte le specie nominali introdotte prima del 1900 e di alcune proposte successivamente. Sulla base del materiale studiato e dei dati desunti dalla letteratura, viene fornito un quadro schematico della distribuzione dei due taxa. Viene inoltre suggerita una guida per futuri lavori tassonomici su questo gruppo di specie.

S. GOFAS, Departamento de Biología Animal, Facultad de Ciencias, Universidad de Málaga, E-29071 Málaga, Spain.
V. GARILLI, Via alla Falconara, 34, I-90136, Palermo, Italy.
M.-C. BOISSELIER-DUBAYLE, Département Systématique et évolution, UMR 7138, Muséum National d'Histoire Naturelle, 43 rue Cuvier, F-75006 Paris, France.

INTRODUCTION

The genus *Cerithium* is represented in the Mediterranean Sea and Ibero-Moroccan area by several species, which usually occupy nearshore environments and may be locally very common. There are discrepant views on their taxonomy at the species and genus level. One extreme view is that every recognizable morph should be named as a species (e.g. LOCARD, 1902; KOBELT, 1908; MONTEROSATO, 1910; NORDSIECK, 1974). BUCQUOY, DAUTZENBERG & DOLLFUS (1884) adopted the other extreme, accepting only two valid species, one of large size, *Cerithium vulgatum* Bruguière, 1792, and a smaller one for which they used the inappropriate name *C. rupestre* Risso, 1826. This has set the keynote for over a century of Mediterranean malacology.

The correct picture nevertheless lies somewhere in between. A quite realistic view is given in the "Atlante" of GIANNUZZI-SAVELLI *et al.* (1996), but without a discussion or justification. Recent work using allozyme electrophoresis (BOISSELIER-DUBAYLE & GOFAS, 1999) has demonstrated that two different species can be distinguished in what has been known hitherto as *"Cerithium rupestre" sensu* B.D.D.

The purpose of this paper is to provide a basis for naming correctly the two species of "smaller" *Cerithium* present in the Western Mediterranean. It is not within the scope to revise all available names, for which more taxonomic work is needed. This revision will be restricted to the species named before 1900, and to some of the later described forms for which we have examined type material. It is based mainly on material examined in Muséum National d'Histoire Naturelle, Paris (hereafter MNHN).

TAXONOMY

The arguments for separating *Cerithium* species have been investigated by BOISSELIER-DUBAYLE & GOFAS (1999), where we used the names *C. lividulum* for one species, and conservatively maintained the name "*C. rupestre*" for the other, which we show here to be correctly named *C. renovatum* Monterosato, 1884. Data from 11 informative allozyme loci yielded fixed alternative alleles in a sympatric population at les Embiez, France, for Aspartate-Aminotransferase (Aat), Glucose-6-phosphate isomerase (Gpi), Isocitrate dehydrogenase (Idh), Lactate dehydrogenase (Ldh), Mannose-6-phosphate isomerase (Mpi), D-octopine dehydrogenase (Odh), one locus of Phosphoglucomutase (Pgm-2) and one of Superoxide dismutase (Sod-2), which is overwhelming evidence for a reproductive isolation. Considering genetic distances calculated from allele frequencies, the population of *C. renovatum* clusters with the local *C. vulgatum* and not with *C. lividulum*.

There are morphological features which allow recognition of the two species (Fig. 1). *Cerithium lividulum* has a sturdy shell, with hardly convex whorls, normally no varixes along the early whorls. The sculpture consists of axial folds and of flat, poorly separated spiral cords. The axial folds sometimes bear some blunt tubercles along their midline. The external surface bears a pattern of greenish brown mottles organized along the spirals on a white background, and which may be darker on the abapical part of the whorls. The shell of *C. renovatum* is smaller (less than 20 mm in our material), more delicate and slender, with a regular series of knobs starting early on the spire and best developed on the penultimate whorl, but otherwise the whorls do not

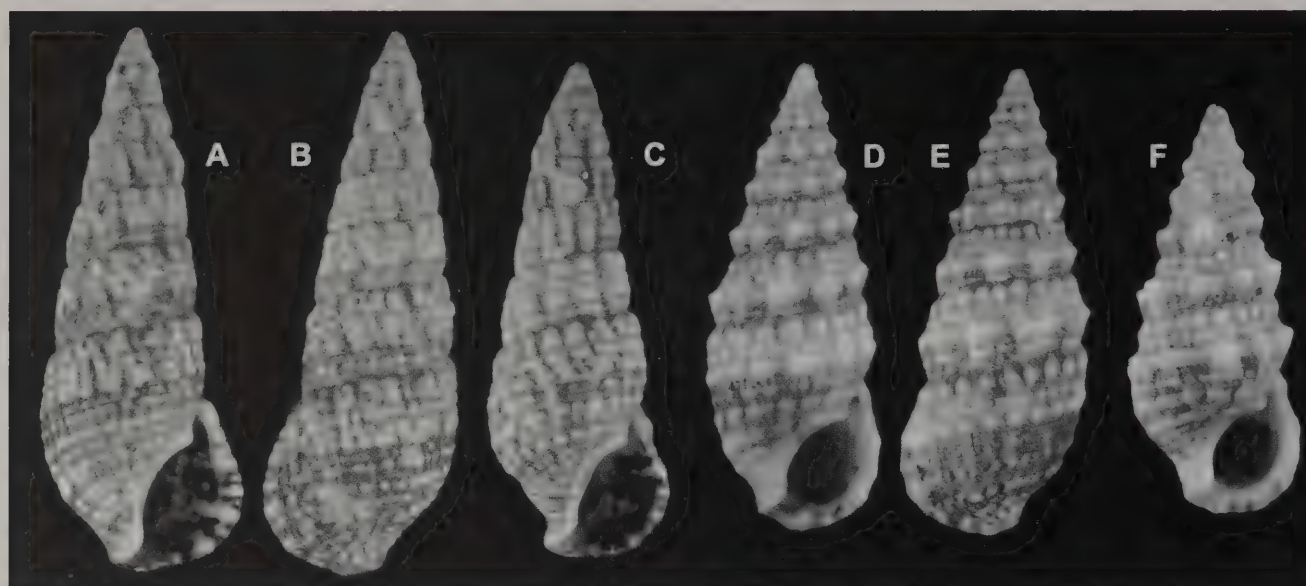



Fig.1. A, B, C: *Cerithium lividulum* Risso, 1826, actual sizes 24.1 and 22.1 mm; D, E, F: *C. renovatum* Monterosato, 1884, actual sizes 20.9 and 18.2 mm. Specimens from sympatric populations studied with allozyme electrophoresis, from Ile des Embiez, France. The specimen on Fig. D-E was maintained in aquarium for spawning (as in Fig. 2B).

Fig. 1. A, B, C: *Cerithium lividulum* Risso, 1826, dimensioni degli esemplari: 24,1 e 22,1 mm; D, E, F: *C. renovatum* Monterosato, 1884, dimensioni degli esemplari: 20,9 e 18,2 mm. Esemplari provenienti da popolazioni simpatriche (Ile des Embiez, Francia), studiati mediante elettroforesi degli alloenzimi. L'esemplare raffigurato in D-E è stato mantenuto in acquario fino alla deposizione dell'ovatura (riportata in Fig. 2B).

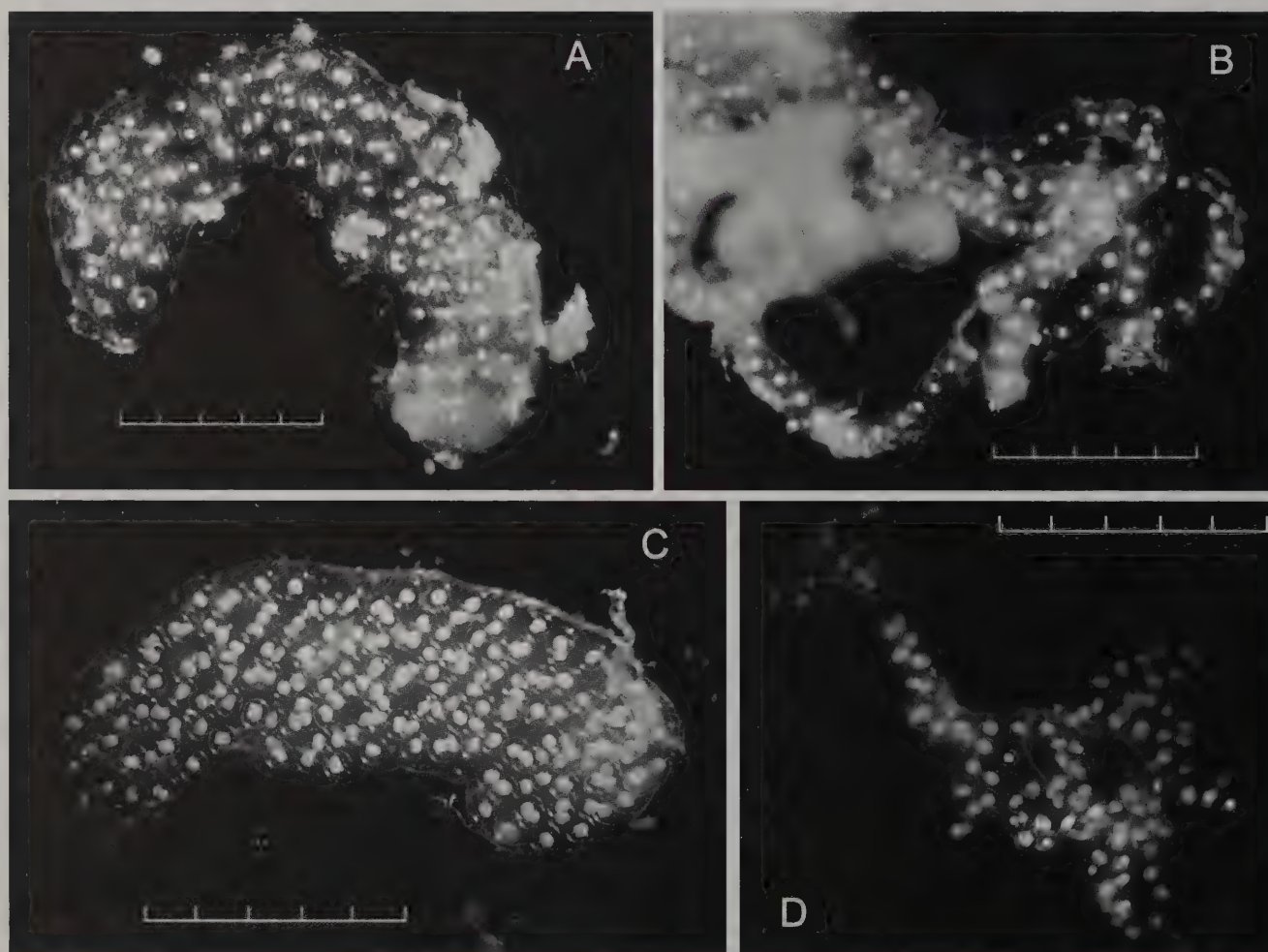



Fig.2. Egg masses of *Cerithium lividulum* (left) and *C. renovatum* (right) obtained in aquaria. A, B: from Les Embiez, France, collected in April 1999; C, D: from Palermo, NW Sicily, Italy, collected in June 2000. Scale bars are 5 mm.

Fig. 2. Ovatura di *Cerithium lividulum* (a sinistra) e di *C. renovatum* (a destra) deposte in acquario. A, B: da Les Embiez (Francia), raccolti nell'aprile 1999; C, D: da Palermo, raccolti nel giugno 2000. Scala: 5 mm.

show distinct axial folds. Compared to spinose forms attributed to *C. lividulum*, the tubercles are more aligned along a keel and are made more conspicuous by a whitish area running along them; the profile of the whorls shows a keel since very early teleoconch whorls. This paler area continues on the body whorl and interrupts the mottled pattern thereon.
The spawn of the two species is also different (Fig. 2). *Cerithium lividulum* lays a massive gelatinous mass across which 4-5 eggs may fit, whereas *C. renovatum* produces a single strand of eggs.

NOMENCLATURE

Cerithium rupestre Risso, 1826.

The specimen in Risso collection (Fig. 3) is small, slender and nodose, and belongs to the complex of *C. vulgatum*. The most similar morphology is found among morphs identified as *C. protractum* (Bivona, 1838) by GIANNUZZI SAVELLI *et al.* (1996: 26-27), which belongs to the *C. vulgatum* species group. Thus, it cannot be used for any of the two species considered here. Anyway, it is not desirable to use the name *C. rupestre* in the sense of BUCQUOY, DAUTZENBERG & DOLLFUS, 1884, since this would not be a clear statement of which species is intended. The possibility that the specimen has been substituted since Risso's publication must also be considered, although it does not essentially contradict Risso's laconic description. The specimen illustrated in Philippe Gény's plate produced ca. 1840 and published by ARNAUD (1978) is a totally different shell, probably exotic, with a definitely distorted siphonal canal like in *Cerithium aluco* (Linné, 1758).

Fig. 3. The lectotype, designated by ARNAUD (1978) of *Cerithium rupestre* Risso, 1826. Actual size: 27 mm (photo MNHN).
Fig. 3. Lectotipo di *Cerithium rupestre* Risso, 1826 designato da ARNAUD (1978). Dimensione dell'esemplare: 27 mm (foto MNHN).

Cerithium lividulum Risso, 1826 (Fig. 4)

Cerithium lividulum Risso, 1826: 154
Type locality: Alpes Maritimes, Mediterranean France
This species is represented in Risso's material, and a lectotype was designated by ARNAUD (1978: 122, pl. 8, fig. 25). The name has remained largely unused, mainly because the other name *C. rupestre* was being used in its place, but there were some clues to its identity since MONTEROSATO (1884: 120) used it as a valid name. This is the name to be applied to one of the species formerly known as *C. rupestre sensu* BUCQUOY, DAUTZENBERG & DOLLFUS, 1884.

The following synonyms are considered:

Cerithium pictum Anton, 1839
This name has remained obscure but has been clarified since SCHNIEBS (2000: 81-82) designated and figured a lectotype, undoubtedly conspecific with *C. lividulum*.

Cerithium mediterraneum Deshayes, 1843: 313-314
This name was proposed in the Deshayes edition of "Animaux sans vertèbres" and the original reference cites several authors who misused the names *Cerithium tuberculatum* Lamarck (*sensu* BLAINVILLE, 1826) and *C. fuscatum* (*sensu* COSTA, 1829). It should be noted that, although PHILIPPI (1836: 193, pl. 11, fig. 7) and KIENER (1841-42: 30-31) credited the name *C. fuscatum* to O.G. Costa, this name is not separately available and is merely a misuse of *C. fuscatum* Gmelin, 1791.
Deshayes indicates for *C. mediterraneum* a habitat in small, quiet pools with abundant vegetation, which is consistent with what we know for *C. lividulum*. There is in MNHN a lot of 5 syntypes transferred in 1978 from the Deshayes collection in Ecole des Mines de Paris (Fig. 4 C-F). The specimens bear conspicuous spines on the whorls, and their genuine morphology matches that of populations collected in Northeastern Algeria, around Djidjelli (collection Etienne Nelva, MNHN).

Cerithium rupestre var. ***plicata*** Bucquoy, Dautzenberg & Dollfus, 1884: 203, pl. 23 figs 5-6.
Cerithium rupestre var. *minor* Bucquoy, Dautzenberg & Dollfus, 1884
The specific epithet *plicata* is preoccupied by *Cerithium vulgatum* var. *plicata* Philippi, 1836: 193, and the name *minor*, probably intended as infrasubspecific, is preoccupied many times by other varietal names. The material figured by BUCQUOY, DAUTZENBERG & DOLLFUS (1884) is anyway the basis for the widespread usage of the name *C. rupestre*, and one specimen is figured herein (Fig. 4 G-H).

Cerithium strumaticum Locard, 1886: 181-182, 565-566.
Cerithium strumaticum Locard, 1886 is based on a description, on a large series of syntypes from Mediterranean France, and on an

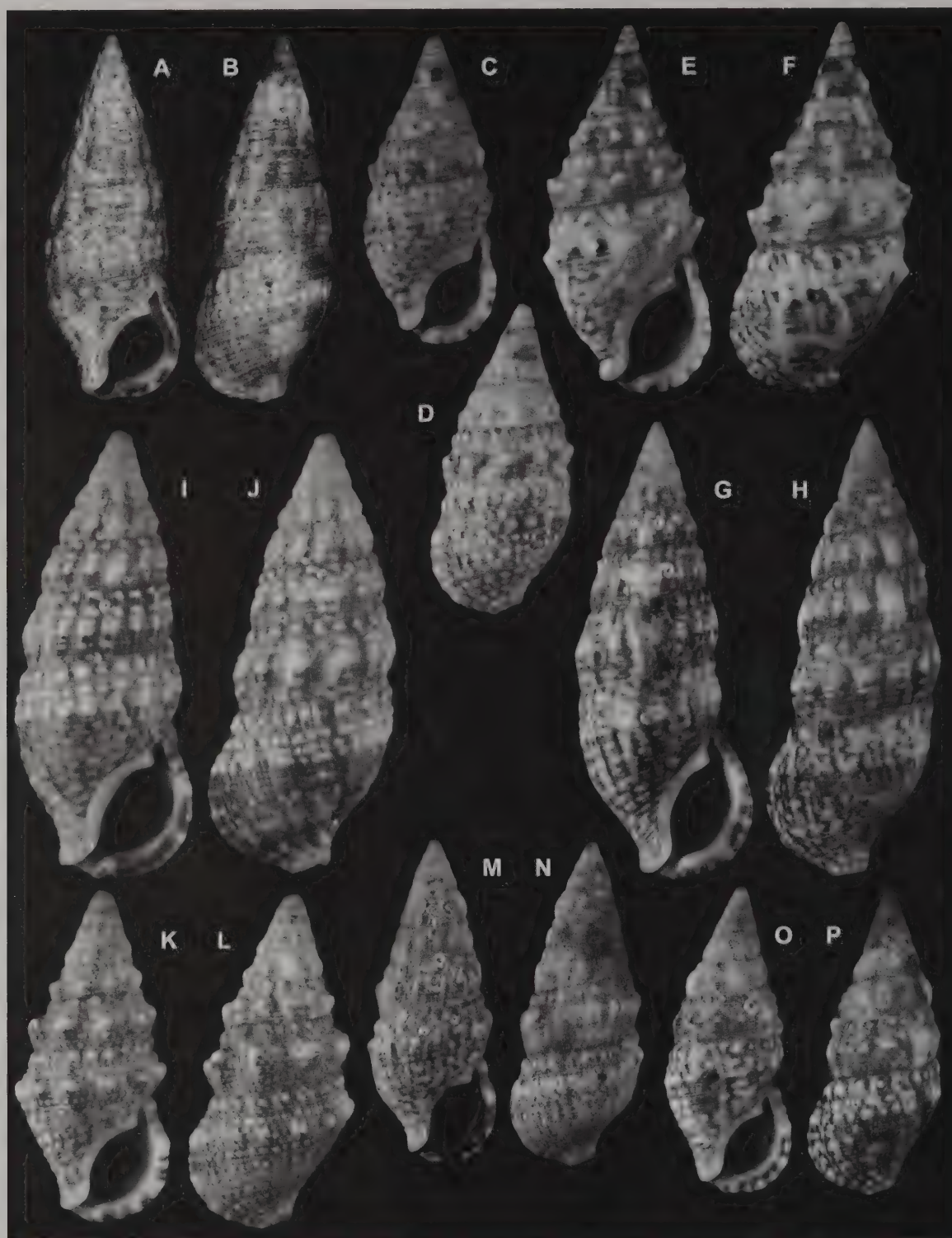



Fig. 4. Type specimens of nominal taxa assigned to *Cerithium lividulum*, all to scale. A, B: Lectotype of *Cerithium lividulum* Risso, 1826 designated by ARNAUD, 1978 (actual size 22 mm; photo MNHN). C, D, E, F: Syntypes of *Cerithium mediterraneum* Deshayes, 1843, no locality given (actual sizes 18.5 and 22.1 mm). G, H: Syntype of *Cerithium rupestre* var. *plicata* Bucquoy, Dautzenberg and Dollfus, 1884, from Roussillon, France (actual size 27.3 mm). I, J: Syntype of *Cerithium strumaticum* Locard, 1886 from Marseille, France (actual size 26.7 mm). K, L: Syntype of *Cerithium massiliense* from Marseille, France (actual size 20 mm). M, N: Lectotype, here designated, of *Cerithium requieni* Locard & Caziot, 1900 from Bonifacio, Corsica (actual size 19.2 mm). O, P: Syntype of *Cerithium palustre* Locard & Caziot, 1900 from Brando, near Bastia, Corsica (actual size 18.2 mm).

Fig. 4. Esemplari tipo di taxa nominali attribuiti a *Cerithium lividulum*; tutti alla stessa scala. A, B: lectotipo di *Cerithium lividulum* Risso, 1826 designato da ARNAUD, 1978 (dimensione: 22 mm; foto MNHN). C, D, E, F: sintipi di *Cerithium mediterraneum* Deshayes, 1843, senza località di provenienza (dimensioni: 18,5 e 22,1 mm). G, H: sintipo di *Cerithium rupestre* var. *plicata* Bucquoy, Dautzenberg e Dollfus, 1884, da Roussillon, Francia (dimensione: 27,3 mm). I, J: sintipo di *Cerithium strumaticum* Locard, 1886 da Marsiglia, Francia (dimensione: 26,7 mm). K, L: sintipo di *Cerithium massiliense* da Marsiglia, Francia (dimensione: 20 mm). M, N: lectotipo, qui designato, di *Cerithium requieni* Locard & Caziot, 1900 da Bonifacio, Corsica (dimensione: 19,2 mm). O, P: sintipo di *Cerithium palustre* Locard & Caziot, 1900 da Brando, nei pressi di Bastia, Corsica (dimensione: 18,2 mm).

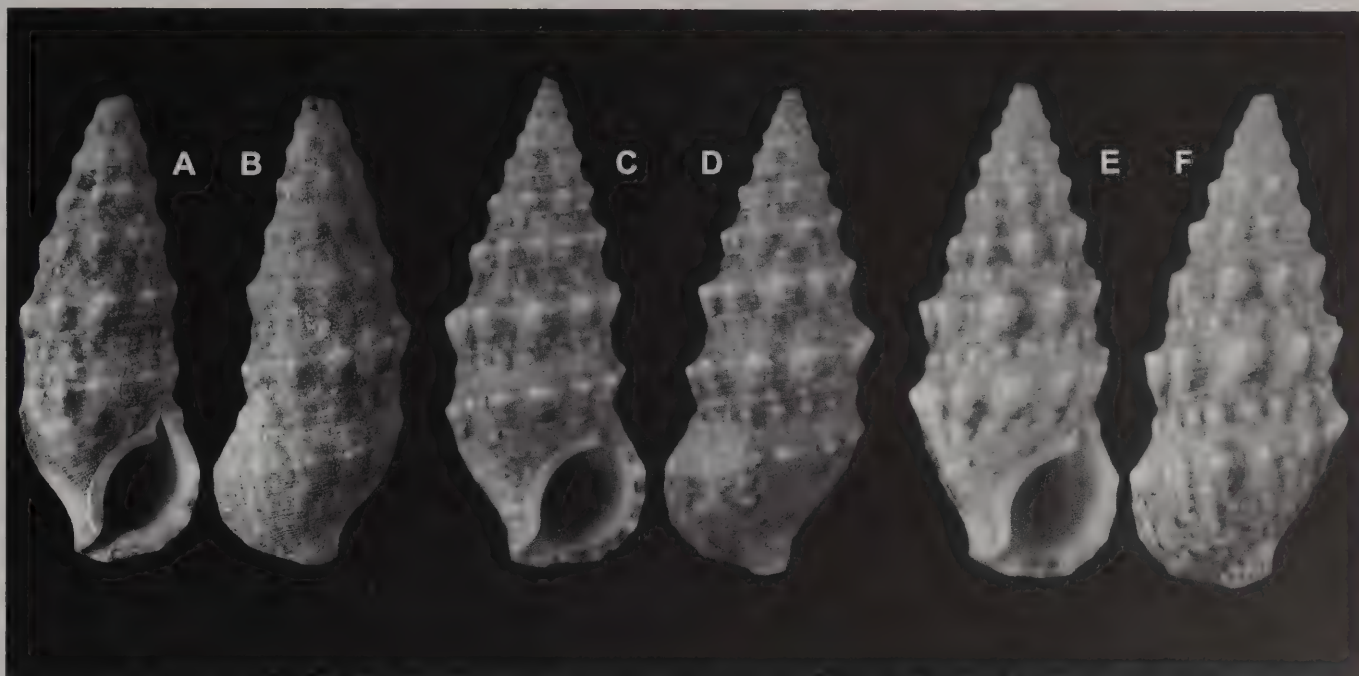



Fig. 5. Specimens of nominal taxa assigned to *Cerithium renovatum*, all to scale. A, B: Lectotype, here designated, of *Cerithium vulgatum* var. *pulchella* Philippi, 1836 (actual size 15.5 mm; ZMHU, Berlin). C, D: Specimen from Palermo, labeled as *C. renovatum* by Monterosato (actual size 16.2 mm; MNHN). E, F: Syntype of *C. payraudeaui* Locard & Caziot, 1900 from Brando, Corsica (actual size 16.5 mm).

Fig. 5. Esemplari di taxa nominali attribuiti a *Cerithium renovatum*; tutti alla stessa scala. A, B: lectotipo, qui designato, di *Cerithium vulgatum* var. *pulchella* Philippi, 1836 (dimensione: 15,5 mm; ZMHU, Berlino). C, D: esemplare proveniente da Palermo, classificato da Monterosato come *C. renovatum* (dimensione: 16,2 mm; MNHN). E, F: sintipo di *C. payraudeaui* Locard & Caziot, 1900 da Brando, nei pressi di Bastia, Corsica (dimensione: 16,5 mm).

explicit reference to the description and figure of *C. rupestre* var. *plicata* in Bucquoy, Dautzenberg & Dollfus (1884). Locard (1886) further named two varieties *major* and *ventricosa* after B.D.D.'s figures 5 and 6. Localities given are Sète, Martigues, Marseille, Toulon, St. Nazaire (now Sanary s/mer, not to be confused with the St. Nazaire on the French Atlantic coast), La Seyne, Cannes, Menton, "etc". There are syntypes in Coll. Locard from Sète, Marseille, Sanary, Toulon, La Seyne, all conspecific, as well as non-type material from other Mediterranean localities. We illustrate here a syntype from Marseille (Fig. 4 I-J).

Cerithium massiliense Locard, 1886: 182, 566.
This is a morph which we consider conspecific with *C. lividulum*, but is characterized by a spinose ornamentation of the shell. Locard cites material from Marseille, Toulon, Nice, "etc...". There are syntypes in Coll. Locard from Marseille (Fig. 4 K-L) and Toulon, and non-type material from several other Mediterranean localities.

Cerithium palustre Locard & Caziot, 1900: 110-111.
The localities mentioned in the original description are in Corsica: Ajaccio, and Brando (a small place near Bastia, to the North; Fig. 4 O-P). These are smaller than the specimens from the same localities on which the authors recognize *C. strumaticum*, and have a quite blunt sculpture. We consider them conspecific as well with *C. lividulum*. Locard & Caziot (1900) describe a *C. palustre* var. *elongata*, which they state being found on the coast of mainland France; this latter name is preoccupied several times (*Cerithium elongatum* Anton, 1839, *Cerithium elongatum* Sowerby G.B. II, 1855).

Cerithium requieni Locard & Caziot, 1900 ; p. 110.
The syntypes present in MNHN consist of three lots from Brando, Bonifacio and Pietranera, and may contain a mixture of *C. lividulum* and *C. renovatum*. One specimen from Bonifacio, which we identify as *C. lividulum*, has been selected here as lectotype (Fig. 4 M-N), in good agreement with the diagnosis which states that it is recognized by its blunt sculpture. The specimens from Brando are rather spinose and belong to *C. renovatum*.

Lithocerithium bellicosum Monterosato, 1917: 19
This species is based on Monterosato's material from Libya, but also on Figs 44-46 of Pallary (1913). It is similar to specimens collected in Djerba, Tunisia ascertained as *C. lividulum*. We do not know the whereabouts of Pallary's Egyptian material.

Cerithium archipelagicum Gaglini, 1992
This was a *nomen nudum*, alluded to only by Monterosato (1917) in connection with *L. bellicosum*, and is based on specimens from the Greek Aegean islands. It was described by Gaglini (1992: 126-127, 147) but introduced as a synonym,

thus not available.

Cerithium renovatum Monterosato, 1884 (Fig. 5)

Cerithium renovatum is a replacement name for *Cerithium vulgatum* var. *pulchella* Philippi, 1836 , preoccupied by *Cerithium pulchellum* J. de C. Sowerby, 1832 and senior homonym of *Cerithium pulchellum* Dujardin, 1837. Thus the type material and type locality are of Philippi (1836).

Cerithium vulgatum var. ***pulchella*** Philippi, 1836: 193, pl. 11, fig. 9.
Two syntypes were found in Berlin Museum, with labels that allow to trace them to Philippi's material. We here select as lectotype (Fig. 5 A-B) the smallest specimen (15.5 x 6.1 mm), which is quite worn but agrees with the concept that MONTEROSATO (1884) had of the species when he introduced the replacement name. It is also this specimen which best agrees with the "natural size" of 18 mm which can be measured on Philippi's plate 11, fig. 9. The other specimen is larger (24.0 x 9.4 mm) and probably does not belong to the same species. We also figure (Fig. 5 C-D) a specimen selected in a lot of 4 specimens from Palermo sent by Monterosato (with manuscript label "*C. vulgatum* var. *pulchella* Ph.") to MNHN. This and several other lots from Palermo in MNHN, (H. Fischer collection: 4 specimens; Vignal collection 5 + 3 specimens, Locard collection, 18 specimens, probably from the same source), represent an abundant material which we consider conspecific.

Cerithium payraudeaui Locard & Caziot, 1900: 109-110 (ex Monterosato ms.).
This is based on specimens from Corsica which are somewhat stouter than the Sicilian *C. renovatum*. There are five lots of syntypes in MNHN, all conspecific: Pietranera (3 specimens), Bastia (5 specimens), Brando (4 specimens; Fig. 5 E-F), St Florent (1 specimen) and Bonifacio (2 specimens). It may be attributed to *C. renovatum*, but also resembles some corsican populations which go to *C. lividulum* based on spawn and allozymes. *Thericium locardi* Nordsieck, 1974 ; p. 11 is an unnecessary replacement name for *Cerithium payraudeaui* Locard & Caziot 1900, which is a senior homonym of *Thericium payraudeaui* Nordsieck, 1974 ex Monterosato (*nomen nudum*, 1910), a representative of the *C. vulgatum* group.

Discussion of the name ***Cerithium aluchensis*** "Chiereghini"

BRUSINA (1898) suggested that *Cerithium aluchensis* "Chiereghini" should have priority over *C. renovatum*. We disagree with his view and hold *C. aluchensis* as a synonym of *C. vulgatum*. In the same paper, BRUSINA (1898) introduces in synonymy (thus, not making it available) another name *C. monterosatoi*, which he had intended at one time for what Monterosato renamed *C. renovatum*.
The name *Murex aluchensis* was first published by NARDO (1847: 61-62), in synonymy of *Cerithium vulgatum* var. *tuberculata* Philippi, 1836. Nardo's text is organized in two columns (paginated separately), the left one listing the names as in Chiereghini's manuscript, the right one giving the "modern synonymy" (which we understand as the names that Nardo deemed valid); when no "modern" name was stated, the Chiereghini name was formally made available with a short description. Thus, we interpret all other names as introduced in synonymy, and not immediately available according to the terms of the code of zoological nomenclature. The name *Murex aluchensis* was made available (with author and date Nardo, 1847) when BRUSINA (1898) used it as a valid name and cited Nardo.
PHILIPPI (1836), in turn, had based his *C. vulgatum* var. *tuberculata* on figure 82 of BUONANNI (1684). This figure represents a tall, nodose form of the *C. vulgatum* group. Furthermore, Nardo states that Chiereghini's material originates from the Golfo Veneto (the Northern Adriatic), where such forms are found, whereas neither *C. lividulum* nor *C. renovatum* are represented. BRUSINA (1866) stated that *C. renovatum* (which he then called *C. minutum* Serres) is found only in Southern Dalmatia, not north of Lesina (now Hvar Island, Croatia).
However, BRUSINA (1870) had used the name *C. aluchensis* with a different meaning. There, he did not refer to Nardo's publication, and made the name available by giving two references:
- *Cerithium vulgatum* var. *tuberculata* Philippi, 1836
- "*Cerithium minutum*" as figured in Sowerby, 1855: 865, pl. 181, fig. 122.
Thus the name *C. aluchensis* Brusina, 1870 ex Chiereghini ms. is separately available and is a junior homonym of *C. aluchensis* (Nardo, 1847 ex Chiereghini ms.). Also, the specimen figured in Sowerby's Thesaurus conchyliorum is not conspecific with *C. aluchensis* (Nardo, 1847). *Cerithium minutum* in SOWERBY (1855: 865) is given with a reference to Philippi and can be traced to "*C. vulgatum* var. *minuta* M. de Serres" as misapplied in PHILIPPI (1836). Thus, it is not a separately available taxon. It is a stout, spinose form resembling the types of *C. mediterraneum* (our Fig. 4 E-F), and probably belongs to *C. lividulum*.
MONTEROSATO (1899) ironically pointed out how Brusina's views on *Cerithium aluchensis* changed from 1870 to 1898, and how both interpretations disagree with Nardo's (1847) which has priority.

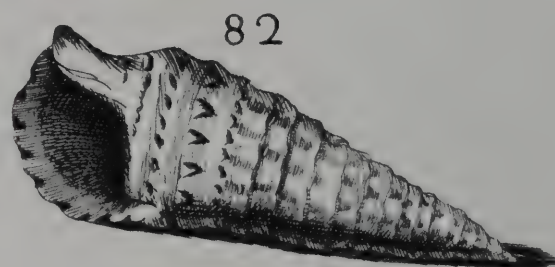



Fig. 6. Reproduction of fig. 82 in BUONANNI (1684), as mirror image so as to restore the aspect of the original woodcut. The figured specimen is hereby designated as lectotype of *Cerithium vulgatum* var. *tuberculata* Philippi, 1836, of *Murex aluchensis* Nardo, 1847 ex Chiereghini ms. and of *Cerithium aluchensis* Brusina, 1870, ex Chiereghini ms.
Fig. 6. Riproduzione della fig. 82 di BUONANNI (1684), riflessa in modo da ripristinare l'aspetto originale della xilografia. L'esemplare figurato viene qui designato come lectotipo di *Cerithium vulgatum* var. *tuberculata* Philippi, 1836, di *Murex aluchensis* Nardo,1847 ex Chiereghini ms. e di *Cerithium aluchensis* Brusina, 1870, ex Chiereghini ms.

We hereby designate the specimen figured in Buonanni (1684: fig. 82, here reproduced Fig. 6) as lectotype of *C. vulgatum* var. *tuberculata* Philippi, 1836, of *C. aluchensis* (Nardo, 1847 ex Chiereghini ms.) and of *C. aluchensis* Brusina, 1870, ex Chereghini ms. in order to make these taxa objective synonyms.

Other names which require further investigation.
There are many more names, all posterior to 1900, available in this species group but most of them cannot be soundly evaluated in the light of the evidence at hand. First, there is a need to settle the taxonomic issues and to make clear statements of which morphological entities represent valid species or subspecies, and this requires genetic investigation. There is at this time no evidence for the status of such forms as found in the eastern Mediterranean or the Atlantic archipelagos, which may, or may not, have genetic continuity with the two species we presently recognize in the Western Mediterranean. The following notes, not exhaustive, could be made in the course of this study of type material in MNHN.

Cerithium tingitanum Pallary, 1920 ex Monterosato ms.: 45, pl. 1, figs 3, 4.
Pallary introduced validly this name with a figure, but stated *C. renovatum* as a synonym. There are several possible syntypes of this species in MNHN (Fig. 7 A-B), but the figured specimen was not found. We also collected specimens with a similar morphology in several localities of the Strait of Gibraltar (Barbate, Getares, Tangiers, Ceuta, M'diq), but not on the northern shore of the Alboran sea which one of us (S.G.) has intensely prospected. Their morphology is confusing, with many traits of *C. renovatum* allied to a size more usual for *C. lividulum*. One possibility is that this represents the westernmost occurrence of *C. renovatum*, in continuity with the main range of the species along the Moroccan Mediterranean coast, but these populations need to be investigated for enzyme polymorphism and spawn.

Hirtocerithium fartulum Monterosato, 1923: 9.
There are three possible syntypes (Fig. 7 C-D) from the type locality Benghazi, Libya, in Vignal collection from Monterosato. These might represent spinose morphs of *C. lividulum*, but a genetic characterization of these North African populations is needed before anything more can be said.

Cerithium syriacum Pallary, 1938: 34, pl. 1, fig. 22.
The Pallary collection in MNHN contains several syntypes (Fig. 7 G-H) from Beyrouth, Lebanon, which have a genuine mosaic-like sculpture and uniform whitish colour. There is also a need for investigation of their relationship with the main

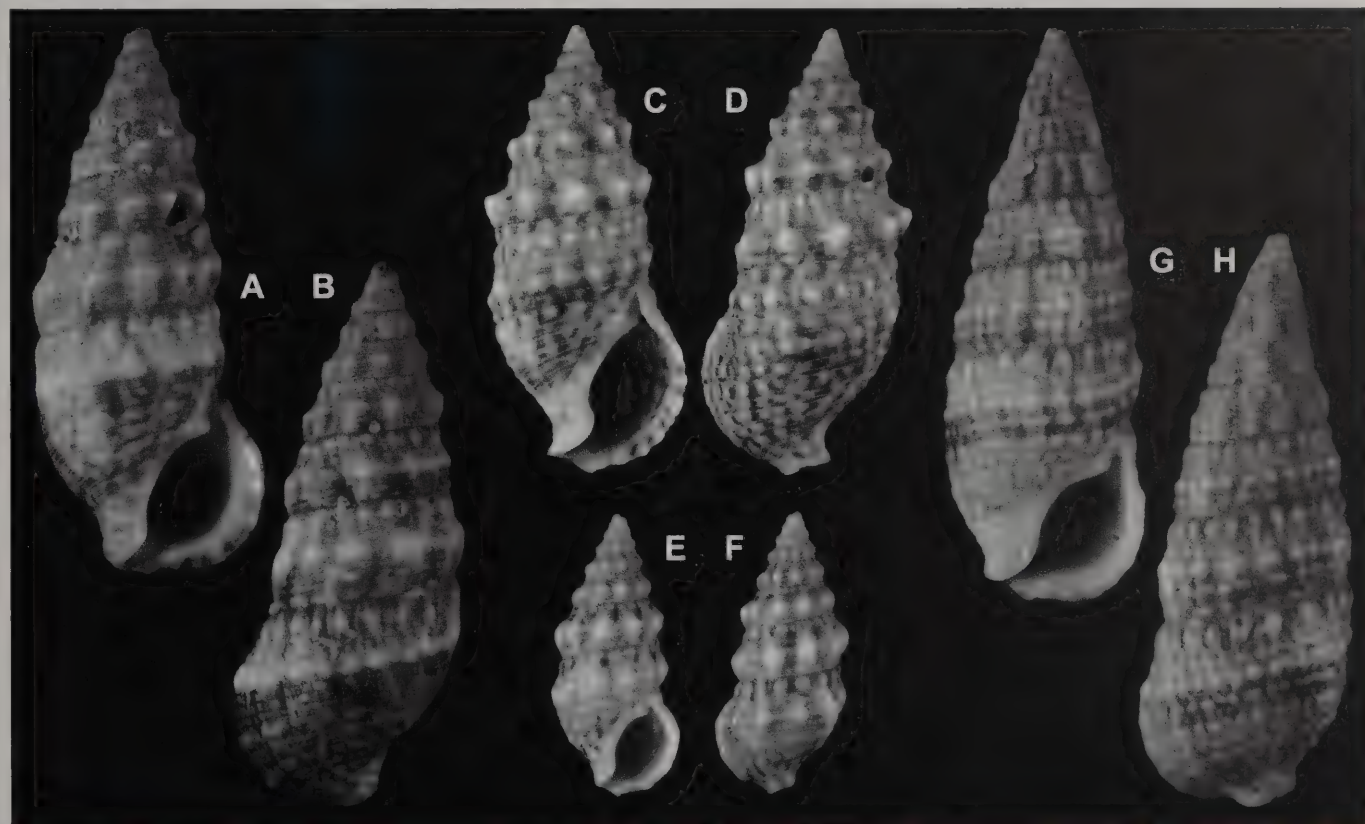



Fig. 7. Type specimens of some nominal taxa introduced after 1900, all to scale. A, B: Syntype of *Cerithium tingitanum* Pallary, 1920 ex Monterosato ms., from Tangiers, Morocco (actual size 22.7 mm). C, D: Possible syntype of *C. fartulum* Monterosato, 1923 from Benghazi, Libya (actual size 18.6 mm; specimen in Vignal collection, MNHN, obtained from Monterosato). E, F: Syntype of *C. phaeniciacum* Pallary, 1938 from Tartous, Syria (actual size 11.9 mm). G, H: Syntype of *C. syriacum* Pallary, 1938 from Beyrouth, Lebanon (actual size 24 mm).
Fig. 7. Esemplari tipo di alcuni taxa nominali introdotti dopo il 1900; tutti alla stessa scala. A, B: sintipo di *Cerithium tingitanum* Pallary, 1900 ex Monterosato ms., da Tangeri, Marocco (dimensione: 22,7 mm). C, D: possibile sintipo di *C. fartulum* Monterosato, 1923 da Bengasi, Libia (dimensione: 18,6 mm; collezione Vignal, MNHN, esemplare ottenuto da Monterosato). E, F: sintipo di *C. phaeniciacum* Pallary, 1938 da Tartous, Siria (dimensione: 11,9 mm). G, H: sintipo di *C. syriacum* Pallary, 1938 da Beirut, Libano (dimensione: 24 mm).

range of *C. lividulum*. PALLARY (1938) also described a *Cerithium syriacum* var. *strigosa* Pallary, 1938: 34, pl. 1, fig. 13, of which we did not find any type material.

Cerithium phaeniciacum Pallary, 1938 ; p. 33, pl. 1 figs 7-8.
This small form was described from Tartous, Syria and is morphologically very distinct from the sympatric *C. syriacum*. There is a possibility that these are the eastern Mediterranean representatives of, respectively, *C. renovatum* and *C. lividulum*, but this has to be demonstrated. There is a lot of three possible syntypes (Fig. 7 E-F) of *C. phaeniciacum* from Tartous, obtained from Pallary, in coll. Vignal, MNHN.

The following names are available for Atlantic insular populations, in which future research may find support for separating different subspecies or species.
- *Thericium strumaticum canariense* Nordsieck, 1974 (type locality Puerto la Cruz, Tenerife).
- *Thericium medrickyi* Nordsieck, 1974 (type locality Lanzarote).
- *Thericium stomum* Nordsieck, 1974 (type locality Lanzarote).

Distribution of the species
The maps of Figs 8-9 have been established on material examined in MNHN collection, and allow a rough representation of the distribution of these species. The distribution of *C.*

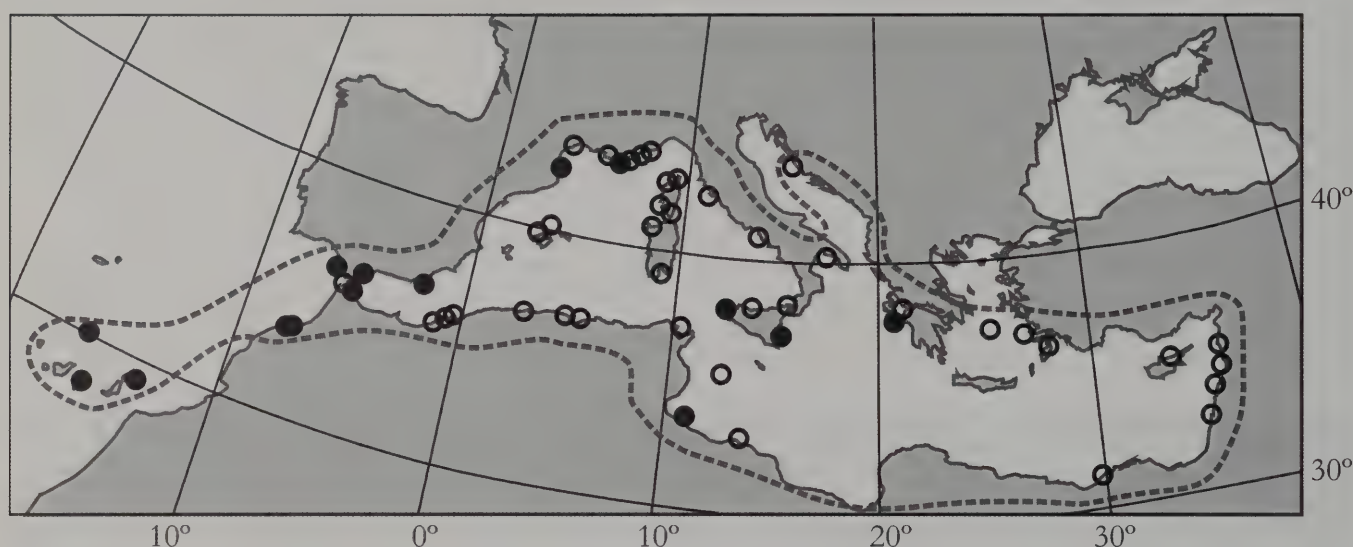



Fig. 8. Distribution of *Cerithium lividulum* according to material examined in MNHN. Open circles: material collected prior to 1950 (mostly, prior to 1900); solid circles: material collected later than 1950 (mostly, later than 1980). Broken line: generalized track deduced from this material and literature data.
Fig. 8. Distribuzione di *Cerithium lividulum* in base al materiale esaminato al MNHN. Cerchi vuoti: materiale raccolto antecedentemente al 1950 (ed in gran parte prima del 1900); cerchi pieni: materiale raccolto dopo il 1950 (principalmente dopo il 1980). Linea tratteggiata: distribuzione della specie in base al materiale studiato ed a dati presenti in letteratura.

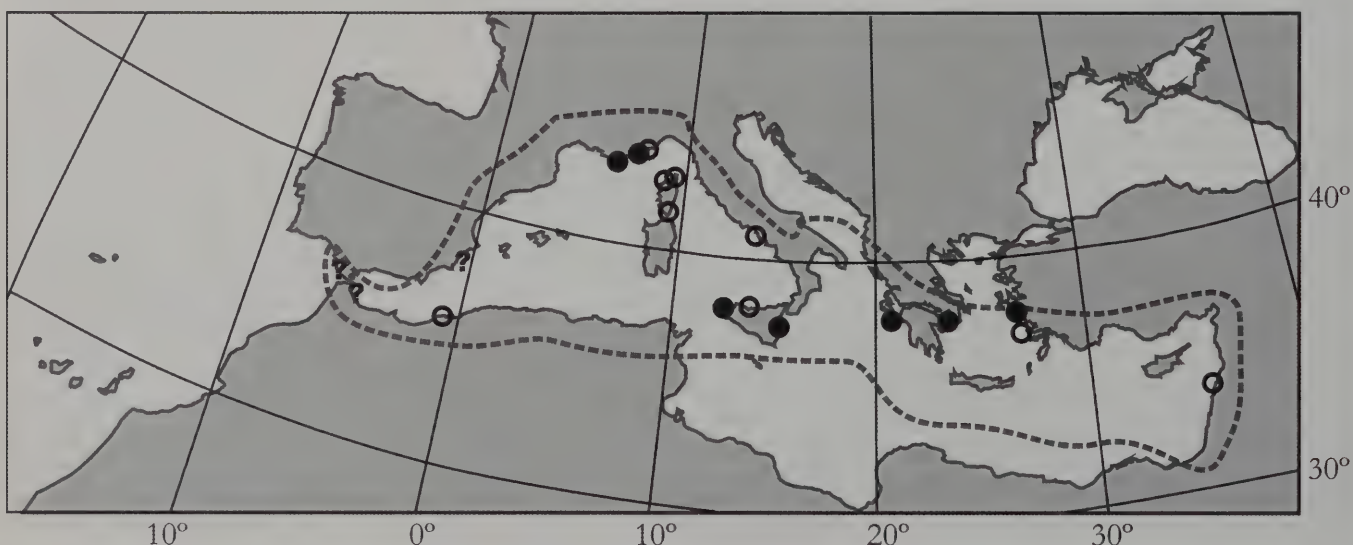



Fig. 9. Distribution of *Cerithium renovatum* according to material examined in MNHN. Open circles: material collected prior to 1950 (mostly, prior to 1900); solid circles: material collected later than 1950 (mostly, later than 1980). Broken line: generalized track deduced from this material and literature data. The (?) refer to localities with *C. tingitanum* morphs.
Fig. 9. Distribuzione di *Cerithium renovatum* in base al materiale esaminato al MNHN. Cerchi vuoti: materiale raccolto antecedentemente al 1950 (ed in gran parte prima del 1900); cerchi pieni: materiale raccolto dopo il 1950 (principalmente dopo il 1980). Linea tratteggiata: distribuzione della specie in base al materiale studiato ed a dati presenti in letteratura. I punti interrogativi si riferiscono a località in cui sono stati rinvenuti esemplari atribuibili al morfotipo *C. tingitanum*.

lividulum is the broadest, with a range extending from the Eastern Mediterranean to the Canary Islands, Selvagens and Madeira. The conspecificity of the macaronesian populations on one side, of Eastern mediterranean populations on the other needs confirmations, but populations on the Atlantic coast of Morocco agree in morphology and habitat with those of the Western Mediterranean, and the population from Malaga province has been checked with allozyme electrophoresis. Some gaps in the distribution may reflect a lack of data but others are real. The species has been searched for, and not found, on the rocky shore of Granada province, where *C. vulgatum* is common. It seems absent from the northernmost Adriatic (Brusina, 1866; Cossignani *et al.*, 1992); the only Adriatic sample in our material originates from Veli Rat, near Zadar, Croatia (Vignal collection, MNHN).
The distribution of *C. renovatum* is more restricted. It includes the Mediterranean coast of France, Corsica, and Sicily. Smaller morphs which may be this species are found in the Eastern Mediterranean, in Greece and (as *C. pheniciacum*) on the Levantine coast. If *C. tingitanum* were to be proved conspecific, the range would include also the Straits of Gibraltar; the continuity with other parts of the range would be through North African populations, given that the species is absent on the shores of Málaga and Granada provinces.

ACKNOWLEDGEMENTS

We are extremely grateful to Matthias Glaubrecht, curator of Mollusca at the Museum fur Naturkunde, Berlin, for making available to us the syntypes of *C. vulgatum* var. *pulchella*, to Luca Galletti (Monreale, Palermo) for providing the photos of the egg masses coming from Sicily, to Sarah Samadi (Institut de Recherche pour le Développement) for the egg masses coming from France, and to Stefano Palazzi (Modena) for help in the bibliographical search. The contribution of one of us (V.G.) was carried out in the Muséum National d'Histoire Naturelle thanks to funds of the European Commission (Environment and Climate Program-Marie Curie, contract n° ENV4-CT98-5125).

REFERENCES

Arnaud P., 1978. Révision des taxa malacologiques méditerranens introduits par Antoine Risso. *Annales du Muséum d'Histoire Naturelle de Nice*, **5**: 101-150.

Blainville H.M.D de, 1828-1830. *Malacozoaires*. [in] *Faune Française*. Levrault, Paris, 320 p., 48 pl. [livr. 18 (1828) p. 1-80; livr. 2 (1829) p. 81-176; livr. 23 (1829) p. 177-240; livr. 28 (1830) p. 241-320].

Buonanni F. 1684. *Recreatio mentis et oculi in observatione animalium testaceorum*. Varesius, Roma, 270 pp., 412 pls, index.

Boisselier-Dubayle M.C. & Gofas S., 1999. Genetic relationships between marine and marginal-marine populations of *Cerithium* species from the Mediterranean Sea. *Marine Biology*, **135**: 671-682.

Brusina S., 1870. *Ipsa Chiereghinii Conchylia ovvero contribuzione pella malacologia adriatica*. Pisa, Biblioteca Malacologica. 280 pp.

Brusina S., 1898. Prilog za Malakolosku faunu novog vinodolskoga. *Hrvatsko naravoslovno drustvo*, Zagreb, **10**: 192-196.

Bucquoy E., Dautzenberg P. & Dollfus G., 1882-1886. *Les mollusques marins du Roussillon*. Tome Ier. *Gastropodes*. J.B. Baillière & fils, Paris, 570 p., 66 pls [pp. 197-222, pls 21-25, january 1884].

Costa O.G. 1829. *Catalogo sistematico e ragionato de' testacei delle Due Sicilie*. Tipografia della Minerva, Napoli, 8 + 132 pp., pl. 1-3.

Cossignani T., Cossignani V., Di Nisio A. & Passamonti M. 1992. *Atlante delle conchiglie del medio Adriatico*. L'Informatore Piceno, Ancona, 118 pp.

Gaglini A., 1992. Terze spigolature... Monterosatiane. *Argonauta*, Roma, 7(1-6): 125-180 («1991» on front cover).

Giannuzzi-Savelli R., Pusateri F., Palmeri A. & Ebreo C., 1997. *Atlante delle conchiglie marine del mediterraneo. Vol 2*. La Conchiglia, Roma, 258 pp.

Kiener L.C. 1841-1842. *Species général et iconographie des coquilles vivantes. Genre Cérite (*Cerithium *Adanson)*. Rousseau & J.B. Baillère, Paris, 104 pp., 32 pls.

Kobelt W., 1887-1908. *Iconographie der schalentragende europäischen Meeresconchylien. Part 2*. Th. Fischer, Cassel, 172 pp., 126 pls.

Locard A., 1886. *Prodrome de malacologie française. Catalogue général des Mollusques vivants de France. Mollusques Marins*. Baillière, Paris, 779 pp.

Locard A., 1902. Les Cerithium et les Cerithidae des mers d'Europe. *Annales, Société d'Agriculture, Sciences et Industrie de Lyon*, **10**: 95-128.

Locard A. & Caziot E., 1900. Les coquilles marines des côtes de Corse. *Annales de la Société Linnéenne de Lyon* (1899), 47: 159-291.

Monterosato T. A. di, 1884. *Nomenclatura generica e specifica di alcune conchiglie mediterranee*. Virzi, Palermo, 152 pp.

Monterosato T.A. di, 1899. Coquilles marines de Chypre, *Journal de Conchyliologie*, Paris, (4) 47 : 392-401.

Monterosato, T.A. di, 1910. Nota su taluni generi e specie della famiglia Cerithiidae. *Giornale di scienze naturali ed economiche di Palermo*, **28**: 65-76.

Monterosato T. A. di, 1917. Molluschi viventi e quaternari raccolti lungo le coste della Tripolitania dall'Ing. Camillo Crema. *Bollettino della Società Zoologica Italiana*, (ser. 3) 4: 1-28, pl. 1.

Monterosato T. A. di, 1923. Molluschi delle coste Cirenaiche raccolti dall'Ing. Crema. *Memorie del Regio Comitato Talassografico*, Venezia, **106**, 14 pp.

Nardo G. 1847. *Sinonimia moderna delle specie registrate dell'opera intitolata: descrizione de'crostacei, de'testacei e de'pesci che abitano le lagune e golfo veneto, rappresentati in figure, a chiaro-scuro ed a colori, dall'Abate Stefano Chiereghini, ven. Clodiense*. Antonelli, Venezia, 127 columns.

Pallary P., 1913. Catalogue des mollusques du littoral méditerranéen de l'Egypte. *Mémoires de l'Institut d'Egypte*, **7**: 139 pp. + 4 pls.

Pallary P., 1920. *Exploration scientifique du Maroc organisée par la Société de Géographie de Paris et continuée par la Société des Sciences Naturelles du Maroc. Deuxième fascicule. Malacologie (1912)*. Larose, Rabat and Paris, 108 pp., 1 pl., 1 map.

Pallary P., 1938. Les Mollusques marins de la Syrie. *Journal de Conchyliologie*, Paris, **82**: 5-58, pl. 1-2.

Nordsieck F., 1974. Il genere "*Thericium*" Monterosato nei mari d'Europa. *La Conchiglia*, Roma, **59**: 3-12.

Risso A. 1826. *Histoire naturelle des principales productions de l'Europe Méridionale et particulièrement de celles des environs de Nice et des Alpes Maritimes. vol. 4*. Paris, Levrault, iv + 439 p.,12 pls.

Schniebs K., 2000. Die Typen und Typoide der Molluskensammlung des Staatlichen Museums für Tierkunde Dresden (I) Die Typen von Anton (1838) beschreibenen rezenten Mollusken. 5. Phasianellidae, Lit-

torinidae, Thiaridae, Cerithiidae, Turritellidae, Ranellidae, Olividae, Achatinellidae. *Malakologische Abhandlungen*, Dresden, 20(8): 79-87.

Sowerby G.B. II 1855. *Monograph of the genus* Cerithium, *Adanson.* p. 847-899, pls 176-186. in: *Thesaurus conchyliorum, or monographs of genera of shells.* London, Sowerby.

Lavoro accettato il 15 marzo 2002

Prima segnalazione di *Mathilda barbadensis* Dall, 1889, in Mediterraneo (Heterostropha, Mathildidae)

Romualdo Rocchini

KEYWORDS Mathildidae, Mar Tirreno, new findings, thanatocoenose.

ABSTRACT *Mathilda barbadensis* Dall, 1889, is reported for the first time in the Mediterranean Sea on the base of two empty shells collected in the Tuscan Archipelago (Gorgona Is.) and Sicily (Cape S. Alessio). The specimen from the Tuscan Archipelago was collected at a depth of 300-450 m, together with four specimens of *Tuba jeffreysi* (Dall, 1889), all inside an amphora fragment. The specimen from Sicily was collected on a silty sand bottom at 210 m. With this new record, the number of species of the family Mathildidae known in the Mediterranean Sea can be fixed at seven. However, since both specimens were dead collected, it is still not possible to undoubtely ascertain that *M. barbadensis* could be a member of the present living fauna of the Mediterranean Sea.

RIASSUNTO Si riportano qui due ritrovamenti dall'Arcipelago Toscano (isola di Gorgona) e dalla Sicilia (Capo S. Alessio) di conchiglie prive di parti molli di *Mathilda barbadensis* Dall, 1889.

R. ROCCHINI, Via Don Bosco 17, 51100 Pistoia (Italia)

Le specie della famiglia Mathildidae finora note per il Mediterraneo (Oliverio & Nofroni, 1986, 1988; Giusti & Nofroni, 1995) sono sei, cinque attribuite al genere *Mathilda* Semper, 1865, ed una al genere *Tuba* Lea, 1833 (su un totale di nove specie finore note per il NE Atlantico: CLEMAM., http://www.mnhn.fr/base/malaco.html).

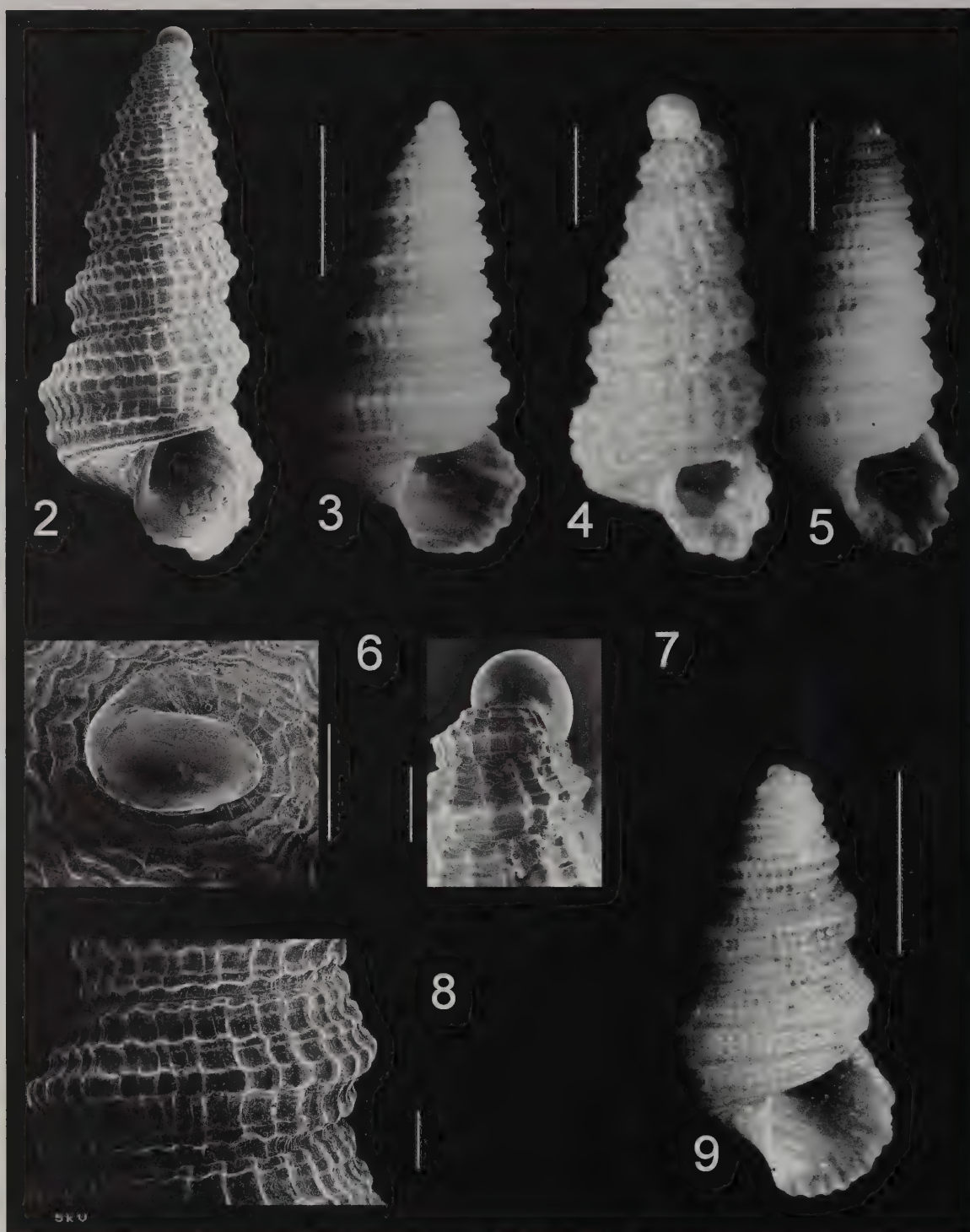
In un campione di sedimento detritico-fangoso rinvenuto all'interno di un'anfora pescata ad una profondità di 300-450 m sui fondali circostanti l'isola della Gorgona (Arcipelago Toscano: Fig. 1), sono stati rinvenuti quattro esemplari di *Tuba jeffreysi* (Dall, 1889) (Fig. 9) ed un esemplare di una specie del genere *Mathilda*, simile per alcuni versi a *M. coronata* Monterosato, 1875, ma distinta per il differente rapporto altezza/diametro e per la differente disposizione della scultura spirale.

Questo esemplare è decisamente ricollegabile a *Mathilda barbadensis* Dall) (1889 (Fig. 2-3-6-7-8). Questo taxon era già stato riportato per il Mediterraneo da Piani (1981), che citò *barbadensis* proprio tra i sinonimi di *M. coronata*. Successivamente Oliverio & Nofroni (1986) assimilarono *barbadensis* a *M. gemmulata* Semper, 1865 (Fig. 4). In seguito (Oliverio & Nofroni, 1988) tale sinonimia fu rimossa, risultando *gemmulata* (= *canariensis* Dautzenberg, 1889, = *haasi* Mienis, 1978, = *vanaartseni* De Jong & Coomans, 1988) una specie ad ampia distribuzione (dai Caraibi al Mediterraneo orientale) ma di acque più superficiali, e decisamente distinta morfologicamente. Un secondo esemplare, anch'esso privo di parti molli è stato rinvenuto (Dr. S. Giacobbe, Messina: com. personale) presso Capo S. Alessio, in un ricco campione fango-sabbioso (biocenosi del detritico del largo) da 210 m di profondità. Si illustra qui l'esemplare rinvenuto alla Gorgona. La vera *M. barbadensis* non era perciò stata rinvenuta effettivamente in Mediterraneo finora. I due esemplari oggetto di questa nota sono stati raccolti privi di parti molli, quindi l'appartenenza di *M. barbadensis* alla fauna attuale mediterranea non può essere confermata.

Fig. 1. Località di rinvenimento di *Mathilda barbadensis* in Mediterraneo. A: Is. della Gorgona (Arcipelago Toscano). B: Capo S. Alessio.
Fig. 1. localities where *Mathilda barbadensis* specimens were recorded in the Mediterranean Sea. A: Gorgona Island (Tuscan Archipelago). B: S. Alessio Cape.

RINGRAZIAMENTI

Si ringraziano Antonio Bonfitto (Bologna) e Bruno Dell'Angelo (Prato) per l'assistenza nella realizzazione delle foto al SEM, Italo Nofroni e Marco Oliverio (Roma) per le informazioni su *M. barbadensis*, Salvatore Giacobbe (Messina) per la segnalazione del secondo esemplare, ed infine i fratelli Roberto e Sandro Mancini per la pazienza nel fornirmi il materiale di ricerca.

BIBLIOGRAFIA

Figg. 2-9. Mathildidae da Is. della Gorgona. 2-3: *Mathilda barbadensis*; 4: *M. gemmulata*; 5: *M. cochlaeiformis*; 6-7: due viste della protoconca di *M.barbadensis*; 8: dettaglio della scultura di un giro mediano di *M. barbadensis*; 9: *Tuba jeffreysi*. Scale: 3 mm (2-5, 9), 500 µm (6-8).
Figs 2-9 . Mathildidae from Gorgona Island. 2,3: *Mathilda barbadensis*; 4: *M. gemmulata*; 5: *M. cochlaeformis*; 6,7 two views of the protoconch of *M. barbadensis*; 8: detail of the sculpture of a middle whorl of *M. barbadensis*; 9: *Tuba jeffreysi*. Scale: 3 mm (2-5, 9), 500µ (6-8).

GIUSTI FR. & NOFRONI I., 1995. Prima segnalazione di *Gegania jeffreysi* (Dall, 1889) in Mar Mediterraneo (Gastropoda: Heterostropha: Mathildidae). *Notiziario CISMA*, 16: 27-30

OLIVERIO M. & NOFRONI I., 1986. Sistematica e zoogeografia della "quinta" *Mathilda* del Mediterraneo: *Mathilda gemmulata* Semper, 1865 (Allogastropoda). *Notiziario CISMA*, Roma 7-8:21-26

OLIVERIO M. & NOFRONI I., 1988. Su *Mathilda gemmulata* Semper, 1865 = *Mathilda barbadensis* sensu Warmke & Abbott, non Dall. (Mathildidae: Allogastropoda). *Notiziario CISMA*, Roma **10** (11):33-35

PIANI P., 1981. Catalogo dei Molluschi conchiferi viventi del Mediterraneo. Errata corrige ed Emendatio. Suppl. Bollettino Malacologico 17.

Lavoro accettato il 15 Marzo 2002

Bollettino Malacologico, Roma, **39** (5-8): 107-110, [2003] 2004 - Società Italiana di Malacologia

A revision of *Marginella reeveana* Petit, 1851

Franck Boyer, Peter Ryall, Andrew Wakefield

KEY WORDS: Marginellidae, *Marginella*, endemism, Ghana.

ABSTRACT *Marginella reeveana* Petit, 1851 is revised on the basis of its type material. A lectotype is appointed and a new type locality is established. The variability of the shell is displayed. The distribution and the relationships of the species are discussed. *M. reeveana* is considered as an isolated southern representant of a widely distributed tethyan group, ranging in the recent from the Arabian sea to West Africa.

RIASSUNTO La specie *Marginella reeveana* Petit, 1851 viene ridescritta sulla base dell'esame del materiale tipico e di nuovi ritrovamenti. Tra i tre sintipi conservati presso il Natural History Museum di Londra (NHM), viene designato un lectotipo. La località tipo originale "Guinea", viene qui corretta con "Ghana", un tempo Guinea Britannica, considerando l'apparente assenza della specie nell'attuale Guinea. La distribuzione della specie, la variabilità della conchiglia e le relazioni con specie simili vengono discusse. In particolare, *M. reeveana* sembra essere endemica delle coste del Ghana e potrebbe rappresentare il relitto tetideo più meridionale di un gruppo di specie ad ampia diffusione, il "*M. denticulata complex*", i cui rappresentanti attuali sono ora distribuiti dal Mar Arabico fino all'Africa Occidentale. *M. reeveana* può essere facilmente distinta da queste specie affini, grazie alla presenza di alcune peculiarità morfologiche: i) coste assiali più numerose che si estendono lungo tutta la lunghezza della conchiglia, ii) profilo più arrotondato e piriforme, iii) protoconca più grande, iv) labbro più inspessito.

FRANCK BOYER , 110 Ch. Marais du Souci, 93270, Sevran, France.
PETER RYALL, P.O. Box 224, Takoradi, Ghana.
ANDREW WAKEFIELD, 14 Forest Side, Buckhurst Hill, Essex, IG9 5SL, U.K.

INTRODUCTION

The species *Marginella splendens* Reeve, 1842 was based on 3 shells belonging to the renowned collection of Hugh Cuming (1791-1865) and said to originate from 'Guinea'. *M. reeveana* was given by Petit (1851) as replacement name for *M. splendens* Reeve (non Grateloup, 1834).

Despite the many important samplings of Marginellidae made off the coasts of West Africa (including the Guinean coast and the Gulf of Guinea) during the 150 years following its description, the species has only ever been known from the three syntypes in the Natural History Museum, London. It is hardly surprising therefore that the Guinean origin of this species has been doubted, with some workers tending to believe in a varietal status of the taxon, whose shell morphology and pattern of decoration strongly resembles the species *M. denticulata* (Link, 1807). The latter is widespread off central Senegal (Dakar and Petite Cote) and displays a very high variability of both shell morphology and decoration rarely seen in the family Marginellidae. Some similar forms are known from Casamance (southern Senegal) to Sierra Leone. It can be assumed that several sibling species may well be separated in the future from this *M. denticulata* complex.

During the years 1985-86, the second author obtained a lot of 9 live collected specimens, trawled up by commercial fishing operations in 40-60 metres off Elmina, central coast of Ghana. Due to the rapid exhaustion of fish stocks, the trawlers soon left the area and the supply of *M. reeveana* samples came to an end. This restricted lot of shells does, however, enable us to have a more detailed look at the variability of the species and its likely distribution whilst allowing us to review its taxonomic status.

ABBREVIATIONS

NHM	Natural History Museum, London.
MC	Museum of Hugh Cuming
AWC	A. Wakefield collection
PRC	P. Ryall collection
spm	live collected specimen

SYSTEMATICS

Genus: Marginella Lamarck, 1799 [Type species, by monotypy: *Voluta glabella* Linné, 1758.]

Marginella reeveana Petit, 1851
(Figs 1-9)

Marginella splendens REEVE, 1842 b, p.249, pl. 277, figs 2-3.
Marginella reeveana PETIT, 1851, p.51, replacement name for *Marginella splendens* Reeve, 1842, non-*Marginella splendens* Grateloup, 1834.

Type material. 3 syntypes in NHM (Figs 1-3), with several accompanying labels. Original label: "*Marginella splendens* Reeve Type Guinea M.C." Recent label by K. Way, present curator of Mollusca: "BM(NH) reg. no. 1975008 Syntypes Conch. Icon. 15 Marginella Sp. 30 1865 Guinea. Hugh Cuming Colln. 3 spcs Acc. N. 1829".

As noted by Tomlin (1917), the largest syntype of *M. splendens* is evidently the figured type. This largest specimen (Figs 1,2) is hereby appointed as lectotype of *Marginella reeveana* Petit, 1851, replacement name of *M. splendens* Reeve, 1842.

Other material examined. Ghana, off Elmina, 40-60 m: 8 spm, PRC; 1spm, AWC.

Type locality. "Guinea". According to the apparent absence of the species off the present state of Guinea and its occurrence off the present state of Ghana (formerly British Guinea), the type locality is here confirmed as "Guinea, present state of Ghana, West Africa".

Original description. In his Conchologica Systematica, REEVE (1842 b: 249) quotes his new species as '*Marginella splendens*, (Humphrey, MSS). Nobis, Proceedings Zool. Soc., 1842' and illustrates it with two figures (pl. 277, figs 2,3: dorsal and ventral views) corresponding to our lectotype (Figs 1,2). No further description is given.
The reference made by REEVE to the Proceedings constitutes a mistake, as the corresponding article (1842 a) does not deal with *Marginella splendens*, nor indeed with any other Marginellidae. TOMLIN (1917) has confirmed the quotation and drawings in Conchologica Systematica (REEVE, 1842 b) as constituting the original description.

Complementary description. SOWERBY (1846: 375) gave the first consistent definition of the species on the basis of the type material, and illustrated both the largest syntype (1846: pl. 74, fig. 23) in ventral view (Fig. 1) and the medium sized syntype (pl. 74, fig. 24) in dorsal view (Fig. 3):

« 7. *Marginella Splendens* (pl. LXXIV. f.23, 24), Reeve, *Zool. Proc.* 1842, and *Conch. Syst.*
M. ovali, creberrimè plicata, pallidè rosea, griseo vel rubro nebulata, maculis griseis vel roseis curvatis per seriebus tribus dispositis; spira producta, anfractibus rotundatis; columella plicis quatuor sub-quadratis ultimus duabus qbliquis; labio externo anticè emarginato, intùs crenulato, extùs punctato.
Like *M. glabella* in general form, but finely ridged, and having three rows of curved spots on the back, besides the minute dots which cover the shell. In Mr. Cumings Collection; from Guinea"

PETIT (1851: 51) implicitly proposed that *M. reeveana* as a replacement name for *M. splendens*, without giving any further description or figure.

Redescription. (on the basis of the new material examined, Figs 1-9): The shell has 3.5 whorls and presents a pyriform outline. Protoconch large and pronounced. Spire small, triangular and stepped, the whorls are inflated, the shoulder is strongly rounded, the surface of the entire body whorl is sculptured by narrow, tightly packed axial ribs. Outer lip thick and arched, 16-20 strong labial teeth, 4 strong and sinuous columellar plications. The shell is covered by minute black dots, regularly distributed along rows in spiral alignment. The decoration of the body whorl is completed by 2 spiral rows of chevrons oriented towards the left and separated by a large spiral colour band situated at the level of the upper part of the aperture. The spire whorls show a row of chevrons which may be partially hidden under the suture above. The inside of the siphonal canal bears a dark colour patch along its border. The colour decoration ranges from pinkish to orange-brown or greyish-blue, on a whitish to light yellowish background.

Dimensions. Shell measurements of the syntypes: 23.8 x 13.5mm (Figs 1,2), 19.4 x 11mm (Fig. 3), 14.9 x 9.7 mm. Other material studied: L=19 to 25.25 mm.

Distribution. The species seems to be endemic from the central coast of Ghana (not known from off Ivory Coast nor from the eastern part of the Gulf of Guinea).

DISCUSSION

The new material studied shows itself to be very similar to the type material, and *M. reeveana* therefore seems to be a very constant species. The morphology of the shell exhibits several original characters which allow it to be distinguished from *M. denticulata 'sensu auctorum'*: the axial ribs are more numerous and extend the length of the shell, the outline is more pyriform and rounded, the protoconch is larger and the labrum is more thickened. These features are not found in the numerous intra & interpopulational variations observed within the *M. denticulata* complex ranging in the Senegal/Sierra Leone area, and *M. reeveava* can be strictly separated on the basis of these shell morphology particularities. The decoration however is the same as that observed throughout the full range of variation observed in *M. denticulata* from central Senegal.
Any form of *M. denticulata* and any other close relatives are known off Ivory Coast or from other places in the Gulf of Guinea, where *M. reeveana* appears as being the single representant of the *M. denticulata* complex.
The endemic status of *M. reeveana* in Ghana is not entirely a surprise as the region has special biogeographic significance. The coast of Ghana belongs to the "atypical tropical region" ranging from Cape Palmas to Benin, and is characterized by a rather high productivity of demersal species (1.2 mt/km^2) compared to the surrounding regions (LE LOEUFF & VON CONSEL, 1998: 318). This higher productivity seems to be correlated to a higher diversity.
Due to the seasonal alternance of cold upwelling currents, the region has maintained a noticeable incidence of species showing strong affinities with the recent temperate European fauna, together with representatives of intertropical groups resulting from the Pliocene Euro-West African stock. Within this region, the coast of Ghana can be considered (LE LOEUFF & VON CONSEL, 1998: 319) as a "relict pocket" for the old tethyan fauna.
M .reeveana must be considered as belonging to this case, being the most southern ranging representative of the *M. denticulata* complex, and showing strong affinities with *M. obtusa* Sowerby, 1846 from the Arabian Sea, which is apparently associated itself with several sibling species in the same area. It can be assumed that *M. reeveana* is a representant of a widely distributed tethyan group of *Marginella*, which is being conserved off West Africa through a fragmented set of species. The *M. denticulata* complex

Figs 1-9: *Marginella reeveana* Petit, 1851. Figs 1,2: lectotype NHM, 23.8 x 13.5 mm. Fig.3: paralectotype NHM, 19.4 x 11.0 mm. Fig. 4: PRC, 21.85 x 13 mm. Fig.5: AWC, 19.75 x 11.6 mm. Fig.6: PRC, 25.25 x 15.30 mm. Fig.7: PRC, 23.95 x 13.70 mm. Fig.8: PRC, 23.7 x 14.30 mm. Fig.9: PRC, 24.2 x 14.10 mm.

Figg. 1-9: *Marginella reeveana* Petit, 1851. Figure 1-2: lectotipo NHM, 23.8 x 13.5 mm. Fig.3: paralectotipo NHM, 19.4 x 11.0 mm. Fig. 4: PRC, 21.85 x 13 mm. Fig.5: AWC, 19.75 x 11.6 mm. Fig.6: PRC, 25.25 x 15.30 mm. Fig.7: PRC, 23.95 x 13.70 mm. Fig.8: PRC, 23.7 x 14.30 mm. Fig.9: PRC, 24.2 x 14.10 mm.

and the *M. obtusa* complex are under study by the first author.

ACKNOWLEDGEMENTS

Thanks are due to Kathy Way and Joan Pickering (Natural History Museum) for kind assistance and for granting access to the *Marginella* type collection for study.

REFERENCES

LE LOEUFF P. & VON COSEL., 1998. Biodiversity patterns of the marine benthic fauna on the Atlantic Coast of tropical Africa in relation to hydroclimatic conditions and palaeogeographic events. *Acta Oecologica*, 19(3): 309-321.

PETIT DE LA SAUSSAYE S., 1851. Notice sur le genre Marginelle, *Marginella*, Lamarck, suivie d'un catalogue synonymique des espèces de ce genre. *Journal de Conchyliologie*, 2(1): 38-59, pls 1-2.

REEVE L. A., 1842 a. Descriptions by Mr. Lovell Reeve of new species of shells figured in the 'Conchologica Systematica'. *Proceedings of the Zoological Society of London*, 10: 197-202.

REEVE L. A., 1842 b. *Conchologica Systematica, or complete system of conchology*, London, 2: 1-337, pls 130-300.

SOWERBY G.B., II, 1846. 'Monograph of the genus Marginella,' in *Thesaurus Conchyliorum, or figures and descriptions of recent shells*, Sowerby, London, 1(7): 239-406, pls 69-78.

TOMLIN J.R. LE B., 1917. A systematic list of the Marginellidae. *Proceedings of the Malacological Society of London*, 12(5): 242-306.

TOMLIN J.R. LE B., 1917. A systematic list of the fossil Marginellidae. *Proceedings of the Malacological Society of London*, 13(3): 41-65.

Lavoro accettato l' 11 Marzo 2003

Djeddilia and Escoffieria, abnormal specimens of Potamididae (Gastropoda: Caenogastropoda : *Potamides, Tympanotonos*)

Pierre Lozouet

KEY WORDS: Mollusca, *Djeddilia*, *Escoffieria*, *Potamides*, *Tympanotonos*, taxonomy.

ABSTRACT The relationships of the enigmatic modern Red Sea genus *Djeddilia* with the Pliocene genus *Escoffieria* are discussed. Both *Djeddilia* and *Escoffieria* (a junior synonym of *Potamides*) were based on abnormal, partially uncoiled specimens. *Djeddilia djeddilia* is probably a synonym of *Potamides conicus* and in consequence *Djeddilia* would be another junior synonym of *Potamides*.

RIASSUNTO Jousseaume, nel corso della sua lunga carriera di malacologo, ha descritto molti taxa problematici di difficile interpretazione. Nel corso del presente lavoro vengono discusse le relazioni fra un enigmatico genere del Mar Rosso, *Djeddilia*, e il genere pliocenico *Escoffieria*. L'olotipo di *Djeddilia djeddilia* Jousseaume, 1894, fu rinvenuto a Djedda o Jiddah (Coste del Mar Rosso, Arabia), ed è caratterizzato da giri disgiunti e da una conchiglia parzialmente svolta. La stessa morfologia caratterizza anche il genere *Escoffieria* Fontannes, 1880 (specie tipo: *Escoffieria fischeri* Fontannes, 1880), descritto per i depositi pliocenici della Francia sud orientale. Sia *Djeddilia* che *Escoffieria* (che è sinonimo più giovane di *Potamides*) furono istituiti su esemplari anormali, a conchiglia parzialmente svolta. *Djeddilia djeddilia* è probabilmente un sinonimo di *Potamides conicus* e, di conseguenza, *Djeddilia* sarebbe un altro sinonimo di *Potamides*. Altre specie di *Potamididae*, a partire dal genere miocenico *Tympanotonos* fino ai recenti *Potamides* e *Batillaria* possono presentare spettacolari deformazioni della conchiglia probabilmente causate, durante la crescita della stessa, da fenomeni di stress ambientale (ad esempio crisi anossiche) molto frequenti in un ambiente variabile quale quello occupato da questa famiglia di gasteropodi.

Muséum national d'Histoire naturelle, 55 rue de Buffon, 75005 Paris, France
E-mail: Lozouet@mnhn.fr

INTRODUCTION

Various problematic genera or species have been described by Jousseaume. However KASE & VALDÉS (1997) have shown that *Bertinia bertinia* Jousseaume, 1883 is based on the spatula shell layer of the patellogastropod *Cellana nigrolineata* (Reeve, 1854). VAN AARTSEN (2001) focused our attention on an other enigmatic gastropod described by JOUSSEAUME (1894) from Djedda or Jiddah (Red Sea coast, Arabia). The specimen is the holotype of *Djeddilia djeddilia* Jousseaume, 1894, which is characterised by disjointed whorls and a partially uncoiled shell. In the original description the systematic position of *Djeddilia djeddilia* was not indicated. However, JOUSSEAUME (1894) compared it with the Eocene genus *Velainella* (Trochidae) and with *Columna* Perry, 1811 (Achatinidae). LAMY (1932) evoked a distant similarity with *Seguenzia laxa* Jeffreys, 1885 (which has the shape of species of Skeneidae or Haloceratidae) or with *Pyrgulina* (?) (Pyramidellidae). VAN AARTSEN (2001) excluded a position in the Pyramidellidae and suggested a relationship with the family Vermetidae. In fact, that author did not realizes that, as already indicated by Lamy, this species was probably based on an abnormal specimen. In this paper, the systematic position of *Djeddilia* is revaluated after comparison with fossil Potamididae.

RESULTS

Recently, in our monograph of the fauna of the Aquitanian Stage (LOZOUET *et al.* 2001), we discussed the position of various species of Potamididae. We noted that the especially large collections of Miocene *Tympanotonos* specimens, generally include a few very deformed specimens, among which some specimens have partially uncoiled whorls. COSSMANN & PEYROT (1922) assigned these specimens to the genus *Escoffieria* (as *Escoffieria degrangei* Cossmann & Peyrot, 1922). We collected specimens very similar to *E. degrangei* (Fig. 8) that belong without doubt to the species *Tympanotonos tournoueri* (Mayer, 1878) (see LOZOUET *et al.* 2001, pl. 9, figs 7-9). The genus *Escoffieria* Fontannes, 1880 (type species: *Escoffieria fischeri* Fontannes, 1880) has been described from Pliocene deposits of southeastern France. As indicated by Fontannes the unique(?) specimen of *Escofferia fischeri* (Figs 1-2, 7) was collected from a bed that contains principally *Potamides* species [supposed to be *P. granosus* (Borson, 1821) and *P. graecus* (Deshayes, 1832)]. In the opinion of FONTANNES (1879-1882), *Escoffieria* is a "section" of *Potamides* characterised by an uncoiled shell. *Escoffieria degrangei* is very similar to *E. fischeri* (see Figs 7-8) and both are based on abnormal specimens of Potamididae (*Potamides* and *Tympanotonos*). In turn, *Djeddilia djeddilia* closely resembles a broken specimen of *Escoffieria* (Figs 5-6, 7, 8). As indicated by LAMY (1932), the columellar part is "divisé en deux lèvres par un sillon longitudinal" (divided in two lips by a longitudinal groove), it is clearly not at all a columellar fold but the consequence of the shell defomation.

One Recent species of Potamididae, generally identified as *Pirenella conica* (Blainville, 1826), is extremely abundant on the Red Sea shores. LOZOUET (1986) showed that *Pirenella* Gray, 1847 (type species: *Cerithium conicus* Blainville, 1826) is a junior synonym of *Potamides* Brongniart, 1810, and that the Mediterranean

and Red Sea species *Potamides conicus* (= *Cerithium cailliaudi* Potiez & Michaud, 1833) is very similar to the Pliocene species *P. graecus* (Deshayes, 1832). A close relationship with the type species of *Potamides* (*P. lamarcki* Brongniart, 1810 from the Oligocene of France) was also pointed. *Potamides conicus* is well known for this remarkable tolerance of temperature and salinity fluctuations and exhibits a high variability of the shell sculpture (Plaziat 1989). *Potamides conicus* occurs at Djedda, and in the Jousseaume Collection (in MNHN) there is at least one sample of shells with a small size, similar to that of the holotype of *Djeddilia djeddilia*. Another numerous sample of *Potamides conicus* from Djibouti, also similar in size to the Djedda specimens, is present in the Jousseaume Collection. Some specimens from Djibouti (Fig. 3) show a slight deformation leading to a more slender and distorted apex.

Figs 1-8, *Escoffieria*, *Potamides*, *Tympanotonos* and *Djeddilia* species.
Figg. 1-8, specie di *Escoffieria*, *Potamides*, *Tympanotonos* e *Djeddilia*.
Figs 1-2, 7, *Escoffieria fischeri* Fontannes [= ?*Potamides granosus* (Borson)], Pliocene (France); by Fontannes (1880, pl. 10, fig. 19), height: 16 mm.
Figg. 1-2, 7, *Escoffieria fischeri* Fontannes [= ?*Potamides granosus* (Borson)], Pliocene (Francia); da Fontannes (1880, tav. 10, fig. 19), altezza: 16 mm.
Fig. 3, *Potamides conicus* (Blainville), Red Sea (Djibouti), coll. Jousseaume (MNHN-Paris), specimen with a slightly distorted early spire, height: 3.2 mm.
Fig.3, *Potamides conicus* (Blainville), Mar Rosso (Gibuti), coll. Jousseaume (MNHN-Parigi), esemplare con le spire iniziali leggermente distorte, altezza: 3,2 mm.
Fig. 4, *Tympanotonos tournoueri* (Mayer), Aquitanian Stage, Saucats (Lariey) (France), coll. MNHN-Paris, height: 11 mm.
Fig. 4, *Tympanotonos tournoueri* (Mayer), Aquitaniano, Saucats (Lariey) (Francia), coll. MNHN-Parigi, altezza: 11 mm.
Figs 5-6, *Djeddilia djeddilia* Jousseaume, 1894, holotype (6 by Lamy, 1932) [= ?*Potamides conicus* (Blainville)], Red Sea (Djedda, Arabia), coll. Jousseaume (MNHN-Paris), height: 3.3 mm.
Figg. 5-6, *Djeddilia djeddilia* Jousseaume, 1894, olotipo (6 in Lamy, 1932) [= ?*Potamides conicus* (Blainville)], Mar Rosso (Gidda, Arabia Saudita), coll. Jousseaume (MNHN-Parigi), altezza: 3,3 mm.
Fig. 8, *Escoffieria degrangei* Cossmann & Peyrot, 1922 [= *Tympanotonos tournoueri* (Mayer)], Lower Miocene (Aquitanian), Saucats (Lariey), France, coll. MNHN-Paris, height: 6.5 mm.
Fig. 8, *Escoffieria degrangei* Cossmann & Peyrot, 1922 [= *Tympanotonos tournoueri* (Mayer)], Miocene Inferiore (Aquitaniano), Saucats (Lariey), Francia, coll. MNHN-Parigi, altezza: 6,5 mm.

CONCLUSION

These examples reveal that different species of the genera *Tympanotonos* and *Potamides* may have spectacular, recurrent deformations in their shell growth that are probably a consequence of stress in a fluctuating environment. Thus, Furota *et al.* (2002) have shown similar deformations of the shells of potamids snail *Batillaria multiformis* (Lischke, 1869) in severe hypoxia habitats.

Morphs with disjointed whorls and partially uncoiled shells are certainly the most fascinating monsters, and it is not surprising that they received different generic names. The unique specimen of *Djeddilia djeddilia* has been collected on a beach and is very abraded. We may therefore infer that *Djeddilia djeddilia* is likely to be founded on an abnormal, incomplete, partially uncoiled specimen of *Potamides conicus* (Blainville). We may accordingly conclude that *Djeddilia* Jousseaume, 1894 and *Escoffieria* Fontannes, 1880 are simply synonyms of *Potamides* Brongniart, 1810.

ACKNOWLEDGEMENTS

I am grateful to Alan Beu (Institute of Geological and Nuclear Sciences, New Zealand) and Jean-Claude Plaziat (Université Paris-Sud) for improving the text and useful suggestions. Thanks also to Raphael La Perna (Università di Bari) for comments.

REFERENCES

Cossmann M. & Peyrot A., 1922. Conchologie Néogénique de l'Aquitaine. *Actes de la Société Linnéenne de Bordeaux*, 4(1) : 1-322, pls 1-7.

Furota T., Sunobe T. & Arita S., 2002. Contrasting populations status between the planktonic and direct-developing batillariid snails *Batillaria multiformis* (Lischke) and *B. cumingi* (Crosse) on an isolated tidal flat in Tokyo Bay. *Venus*, 61(1-2) : 15-23.

Fontannes F., 1879-1882. *Les mollusques pliocènes de la vallée du Rhône et du Roussillon.* Tome premier. Gastéropodes des formations marines et saumâtres. Georg, Lyon., 277 pp., 12 pls.

Jousseaume F., 1894. Diagnose des coquilles de nouveaux mollusques. *Bulletin de la Société Philomatique de Paris*, 6(8): 98-105.

Kase T. & Valdés A., 1997. The enigma of *Bertinia bertinia* Jousseaume, 1883 solved. *Venus*, 56(3): 233-240.

Lamy E., 1932. Note sur le *Djeddilia djeddilia* Jousseaume (Moll. Gastéropode). *Bulletin du Muséum national d'Histoire naturelle*, (1931), (2)3(8) : 740-743, 1 fig.

Lozouet P., 1986. Redéfinition des genres *Potamides* et *Pirenella* (Gastropoda : Prosobranchia) à partir des espèces actuelles et fossiles. Implications phylétiques et biogéographiques. *Annales de Paléontologie*, 72(3) : 163-210, 15 figs, 3 pls.

Lozouet P., Lesport J.F. & Renard P. , 2001. Révision des Gastropoda (Mollusca) du Stratotype de l'Aquitanien (Miocène inf.): site de Saucats "Lariey", Gironde, France. *Cossmanniana*, Hors-série n°3: 189 pp., 1 tab. , 19 figs, 37 pls.

Plaziat J.C., 1989. Signification écologique et paléogéographique des peuplements oligotypiques de *Potamides* gastéropodes thalassiques. In: *Atti 3° Simposio di Ecologia e Paleoecologia delle communità benthoniche*, Catania - Taormina 12-16 Ottobre 1985. 25-52, 11 figs, 1 tab.

Van Aartsen J.J., 2001. On the enigmatic *Djeddilia djeddilia* Jousseaume, 1894 (Gastropoda, Caenogastropoda, ?Vermetidae). *Basteria*, 65(4-6): 14-146, 2 figs.

Lavoro accettato il 2 Gennaio 2003

Bollettino Malacologico, Roma, **39** (5-8): 113-140, [2003] 2004 - Società Italiana di Malacologia

Fifteen new species and ten new records of *Turbonilla* Risso, 1826 (Gastropoda, Heterobranchia, Pyramidellidae) from Brazil

Alexandre Dias Pimenta[1] *& Ricardo Silva Absalão*[1,2]

KEY WORDS: Pyramidellidae, Turbonilla, taxonomy, Brazil, South America, new species.

ABSTRACT Fifteen new species of *Turbonilla* from Brazilian coast are described: *Turbonilla farinatiae* n. sp., *T. goytacazi* n. sp., *T. farroupilha* n. sp., *T. lepta* n. sp., *T. parviscymna* n. sp., *T. fluminensis* n. sp., *T. aracruzensis* n. sp., *T. midas* n. sp., *T. maestratii* n. sp., *T. kaapor* n. sp., *T. capixaba* n. sp., *T. scapulata* n. sp., *T. paulinoi* n. sp., *T. rhachialis* n. sp., *T. uaca* n. sp. The following species are for the first time recorded from the Brazilian coast: *T. rhabdota* (Watson, 1886), *T.* aff. *zulmae* Pimenta & Absalão, 1998, *T.* aff. *enna* Bartsch, 1927, *T.* aff. *unilirata* Bush, 1899, *T. krebsii* (Mörch, 1875), *T. pupoides* (d'Orbigny, 1842), *T. portoricana* Dall & Simpson, 1901, *T. stimpsoni* Bush, 1899, *T.* aff. *riisei* (Mörch, 1875), *T.* aff. *anira* Bartsch, 1927.

RIASSUNTO Nonostante siano note ben 324 specie di *"Turbonilla"* per le coste dell'Atlantico occidentale, solo venti di queste sono state finora riportate per le coste brasiliane.Nel presente contributo, quindici nuove specie di *Turbonilla* vengono descritte per il Brasile: *Turbonilla farinatiae* n. sp., *T. goytacazi* n. sp., *T. farroupilha* n. sp., *T. lepta* n. sp., *T. parviscymna* n. sp., *T. fluminensis* n. sp., *T. aracruzensis* n. sp., *T. midas* n. sp., *T. maestratii* n. sp., *T. kaapor* n. sp., *T. capixaba* n. sp., *T. scapulata* n. sp., *T. paulinoi* n. sp., *T. rhachialis* n. sp., *T. uaca* n. sp.. Vengono inoltre riportate alcune nuove segnalazioni di specie appartenenti al genere *Turbonilla*, originariamente descritte per la Florida, i Caraibi e le coste dell'Argentina: *Turbonilla rhabdota* (Watson, 1886), *T.* aff. *zulmae* Pimenta & Absalão, 1998, *T.* aff. *enna* Bartsch, 1927, *T.* aff. *unilirata* Bush, 1899, *T. krebsii* (Mörch, 1875), *T. pupoides* (d'Orbigny, 1842), *T. portoricana* Dall & Simpson, 1901, *T. stimpsoni* Bush, 1899, *T.* aff. *riisei* (Mörch, 1875), *T.* aff. *anira* Bartsch, 1927.

1- Departamento de Zoologia, Instituto de Biologia, Universidade Federal do Rio de Janeiro. e-mail: alexpim@biologia.ufrj.br
2- Departamento de Biologia Animal e Vegetal, Instituto de Biologia, Universidade do Estado do Rio de Janeiro. e-mail: absalao@hotmail.com

INTRODUCTION

The taxonomy of the genus *Turbonilla* from the Brazilian coast is poorly understood, in contrast to the coasts of Africa and Europe, where recent syntheses on *Turbonilla* have been carried out (e.g., AARTSEN, 1981; SCHANDER, 1994; PEÑAS *et al.*, 1996; PEÑAS & ROLÁN, 1997). This lack can be addressed to the absence of a major taxonomic review on the family Pyramidellidae, added to the fact that the family is considered one of the most taxonomically confused and poorly known families of marine gastropods. Indeed, taxonomic studies on the Pyramidellidae in a region where it is poorly studied often acknowledge the existence of several undescribed species (e.g. SCHANDER, 1994; PEÑAS & ROLÁN, 1997).

In spite of the very large number of "turbonillid" species described from the western Atlantic (324 species listed in ODÉ, 1996), only 20 species have been reported from the Brazilian coast (RIOS, 1994; ABSALÃO *et al.*, 1996; PIMENTA & ABSALÃO, 2001; PIMENTA & ABSALÃO, 2002).

Recent collections-based studies on pyramidellids from Brazil led us to recognize a large number of undescribed species of the genus *Turbonilla*, and some new records of species of the same genus, originally described from Florida, the Caribbean, and the coast of Argentina.

MATERIALS AND METHODS

Optical photographs were taken through a Zeiss SV-11 microscope. Scanning Electronic photographs were taken by: Zeiss LEO 1450 VP, at "Laboratório de Microscopia Eletrônica" from Universidade do Estado do Rio de Janeiro; Stereoscan 200, Cambridge Instruments, Inc. at ANSP; Zeiss LEO 440 at Laboratório de Microscopia Eletrônica of MZSP; Zeiss LEO 940A at Laboratório de Tribologia e Materiais of the Universidade Federal de Uberlândia; and Zeiss DSM 960 at Departamento de Ciências dos Materiais e Metalurgia of the Pontifícia Universidade Católica do Rio de Janeiro.

In the "Material examined" lists, numbers betweens square brackets refer to the number of shells.

Abbreviations used: --Collections: ANSP - Academy of Natural Sciences of Philadelphia, Philadelphia; BMNH - British Museum Natural History, London; DF - Private collection Daniel Forcelli; IBUFRJ - Instituto de Biologia / Universidade Federal do Rio de Janeiro, Rio de Janeiro; MACN – Museu Argentino de Ciencias Naturales, Buenos Aires; MNHN - Muséum National d'Histoire Naturelle, Paris; MNRJ – Museu Nacional / Universidade Federal do Rio de Janeiro, Rio de Janeiro; MORG - Museu Oceanográfico "Eliézer de Carvalho Rios", Rio Grande; MZSP - Museu de Zoologia da Universidade de São Paulo, São Paulo; MMUFRPE - Museu de Malacologia da Universidade Federal Rural de Pernambuco, Recife; USNM – National Museu of Natural History, Washington, DC; ZMA – Zoölogish Museum Amsterdam, Amsterdam; --Expeditions: AMASSEDS - A Multidisciplinary Amazon Shelf Sedimentary Study; CFVII - Comissão Oceanográfica Cabo Frio VII; GEOMAR XII – Comissão Oceanográfica Geologia Marinha XII; PADCT Programa de Apoio ao Desenvolvimento Científico e Tecnológico; REVIZEE - Recursos Vivos da Zona Econômica Exclusiva; --Collectors: NOAG – Navio Oceanográfgico Astro Garoupa / Petrobras S.A.; AS - Navio Oceanográfico Atlântico Sul / Brazilian Navy; Eq.Zoo. - Equipe do Departamento de Zoologia / IBUFRJ; NOAN - Navio Oceanográfico Antares /

Brazilian Navy; NOAS - Navio Oceanográfico Almirante Saldanha / Brazilian Navy; NOWB - Navio Oceanográfico Professor W. Besnard / Universidade de São Paulo; RVCI - Research Vessel Columbus Iseling, University of Miami.

Systematic

Genus *Turbonilla* Risso, 1826

Turbonilla Risso, 1826: 224. Type species: *Turbonilla costulata* Risso, 1826: 224, fossil, Pliocene, France. Subsequent designation by HERMANNSEN (1852).

Remarks

The genus *Turbonilla* is taken herein in an wide concept, as used by AARTSEN (1981), SCHANDER (1994), PEÑAS *et al.* (1996), and PEÑAS & ROLÁN (1997). In view of the confused and poorly established subgeneric classification, with many artificial and poorly defined subgenera in need of major revision (SCHANDER, 1994), we adopted no subgeneric classification.

Turbonilla farinatiae n. sp. (figs 1-5)

Turbonilla (Turbonilla) atypha Bush, 1899: FARINATI (1993: 299, fig. 2).

Description

Shell tall, strictly conical; color milk-white. Teleoconch whorls almost flat-sided, slightly concave on middle of latter whorls. Suture shallow and straight. Protoconch heterostrophic planispiral; diameter about 320 µm. Axial ribs low, broad, straight and orthocline or slightly opisthocline, fairly distinct on initial 2-4 whorls; 22 ribs on body whorl of holotype; interspaces narrow, about half as wide as the ribs, bearing microscop-

Figs 1-5. *Turbonilla farinatiae* n. sp. 1-4: holotype (MNRJ 8931); 5: paratype (ZMA 4.02.019). Fig. 1: whole shell (length 6.4 mm); fig. 2: last whorl; fig. 3: detail of periphery of base; figs 4, 5: protoconch. Scale bars: 200 µm.

Figg. 1-5. *Turbonilla farinatiae* n. sp. 1-4: olotipo (MNRJ 8931); 5: paratipo (ZMA 4.02.019). Fig. 1: conchiglia intera (lunghezza 6,4 mm); fig. 2: ultimo giro; fig. 3: dettaglio della periferia della base; figure 4, 5: protoconca. Scala di riferimento: 200 µm.

ic axial growth lines, especially visible below the sutures. Spiral sculpture absent, except for microscopic striations. Base rounded with evanescent axial ribs that project a little over it, but do not reach the umbilical region. Aperture rhomboid. Columella straight, without fold. Outer lip thin. No umbilical fissure.

Dimensions

Holotype with 9.25 teleoconch whorls; height 6.4 mm; width 2.0 mm

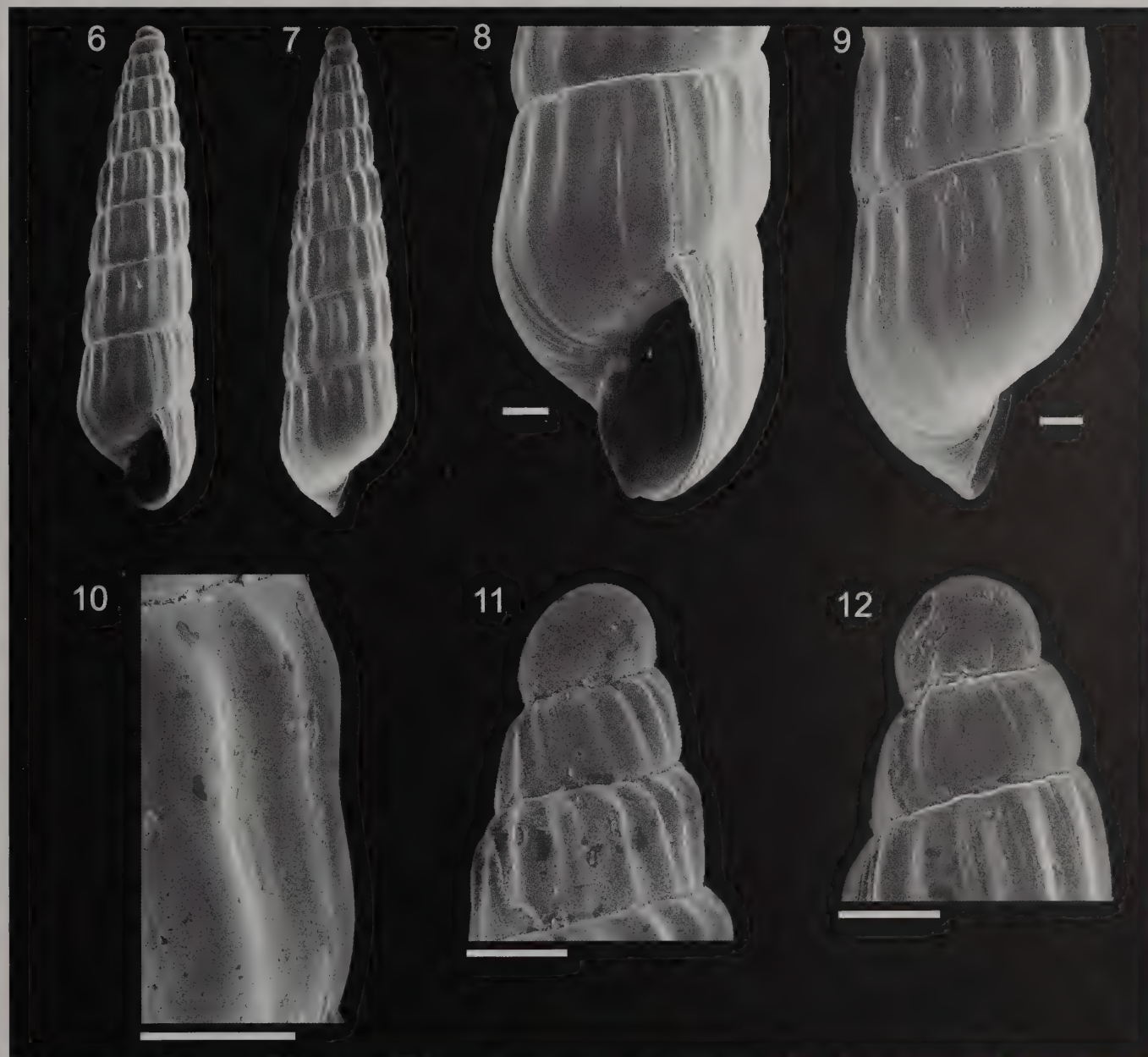
Type material

Holotype: MNRJ 8931, off Cabo Frio, Rio de Janeiro State, CFVII # 6147 (22°53.7'S, 041°50.5'W, 50 m), 24/iii/1983, NOAS coll. Paratypes: MORG 41037, type locality; IBUFRJ 11898; ANSP 410339, Monte Alto, Espírito Santo State, 28/i/1986; MNRJ 8930; MNHN; ZMA 4.02.019, off Rio de Janeiro State CFVII # 6165 (23°02.8'S, 042°46'W, 56 m), 23/iii/1983, NOAS coll.; MZSP 35856, Arquipélago de Santana, Macaé, Rio de Janeiro State, v/1993, NOAG coll.

Type locality

Off Cabo Frio, north coast of Rio de Janeiro State (22°53.7'S, 041°50.5'W, 50 m), southeast coast of Brazil.

Additional material

--Espírito Santo State: IBUFRJ 8859, off Camburi (45 m),

Figs 6-12. *Turbonilla goytacazi* n. sp. holotype (MNRJ 8935). Figs 6, 7: whole shell (length 6.6 mm); figs 8, 9: last whorl; fig. 10: detail of periphery of whorl; figs 11, 12:protoconch. Scale bars: 200 µm.

Figg. 6-12. *Turbonilla goytacazi* n. sp. olotipo (MNRJ 8935). Figg. 6, 7: conchiglia intera (lunghezza 6,6 mm); figure 8, 9: ultimo giro; fig. 10: dettaglio della periferia di un giro; figg. 11, 12: protoconca. Scala di riferimento: 200 µm.

10/vi/1986, Eq.Zoo coll. [1]; IBUFRJ 8858, off Camburi (60 m), 15/i/1987, Eq.Zoo coll. [1]; --Rio de Janeiro State: IBUFRJ 6488, Arquipélago de Santana, Macaé, v/1993, NOAG coll. [3]; IBUFRJ 8853, off Cabo Frio, CFVII # 6147 (22°53.7'S, 041°50.5'W, 50 m), 24/iii/1983, NOAS coll. [7]; IBUFRJ 8854, off Cabo Frio, CFVII # 6199 (23°17'S, 044°15'W, 48 m), 02/iv/1983, NOAS coll. [1]; MORG 13576, off Rio de Janeiro State (40-50 m), "barco de pesca" coll. [1]; IBUFRJ 8855, CFVII # 6165 (23°02.8'S, 042°46'W, 56 m), 23/iii/1983, NOAS coll. [9].

Distribution
Southeast of Brazil (Espírito Santo and Rio de Janeiro States); Holocene of Bahia Blanca, Argentina.

Etymology
This species is named after Dr. Ester Farinati, who contributed a lot to the knowledge of pyramidellids from South America.

Remarks
Farinati (1993) reported *T. atypha* Bush, 1899 from the Holocene of Bahia Blanca, Argentina. However, the illustration provided does not correspond to *T. atypha*, which is more slender and has more convex whorls and somewhat sinuous axial ribs. The figure in Farinati (1993) indicates, rather, an exemplar of *Turbonilla farinatiae* with a slightly wider than normal shell.
The most similar species from the southwest Atlantic is *Turbonilla uruguayensis* Pilsbry, 1897, which has a very similar shell shape, but is larger and bears stronger axial ribs which end abruptly on the periphery of the last whorl. In *T. farinatiae* the ribs project slightly over the base (figs 2, 3). Moreover, both *T. uruguayensis* and *T. atypha* have helicoid protoconchs, while *T. farinatiae* has a planispiral one (figs 4, 5). *Turbonilla paucistriata* (Jeffreys, 1884: 361, pl. 27, fig. 6), described from the Mediterranean, has a very similar sculpture pattern and a planispiral protoconch, but it is less conical than *T. farinatiae* (fig. 1), having a somewhat pupoid shell shape. Moreover, the ribs of *T. paucistriata* are less marked and the inner lip is much more developed than in *T. farinatiae..*

Turbonilla goytacazi n. sp. (figs 6-12)

Description
Shell tall, moderately conical; color milk-white with yellow spiral band above the sutures. Teleoconch whorls almost straight in profile, but slightly concave on middle, slightly shouldered below the sutures, specially on initial whorls. Suture somewhat deep, straight. Protoconch heterostrophic planispiral; diameter about 330 µm. Axial ribs broad, low, straight and orthocline or prosocline with a spiral line of constriction on the middle; 17 on last whorl of holotype; interspaces narrow, about half as wide as the ribs, bearing microscopic axial growth lines. Spiral sculpture absent, except for very thin spiral striae. Base rounded, with evanescent axial ribs that project a little over the it, but do not reach the umbilical region. Aperture rhomboid, tending to pyriform. Columella obliquely straight, with obsolete fold. Outer lip thin. No umbilical fissure.

Dimensions
Holotype with 8 teleoconch whorls; height 6.6 mm; width 1.7 mm.

Type material
Holotype: MNRJ 8935, Bacia de Campos, Rio de Janeiro State (22°15'25"S, 040°19'39"W, 100 m), NOAG coll.; Paratypes: MNHN; ANSP 410340, off Rio de Janeiro State, REVIZEE # 38C (22°00'24"S, 040°05'13"W, 100 m), 08/ii/1997, NOAG coll.; MORG 41038, Bacia de Campos, Rio de Janeiro State (22°15'20"S, 040°19'45"W, 100 m), NOAG coll.; MNRJ 8936, Bacia de Campos, Rio de Janeiro State (22°15'07"S, 040°19'56"W, 95 m), NOAG coll.; IBUFRJ 11899, off Bacia de Campos, Rio de Janeiro State, NOAG coll.; MZSP 28877, 23°57.5'S, 044°53'W, 75 m, 27/vii/1986, NOWB coll.; ZMA 4.02.020, Bacia de Campos, Rio de Janeiro State (22°15'26"S, 040°19'41"W, 105 m), NOAG coll.

Type locality
Bacia de Campos, Rio de Janeiro State (22°15'25"S, 040°19'39"W, 100 m), southeast coast of Brazil.

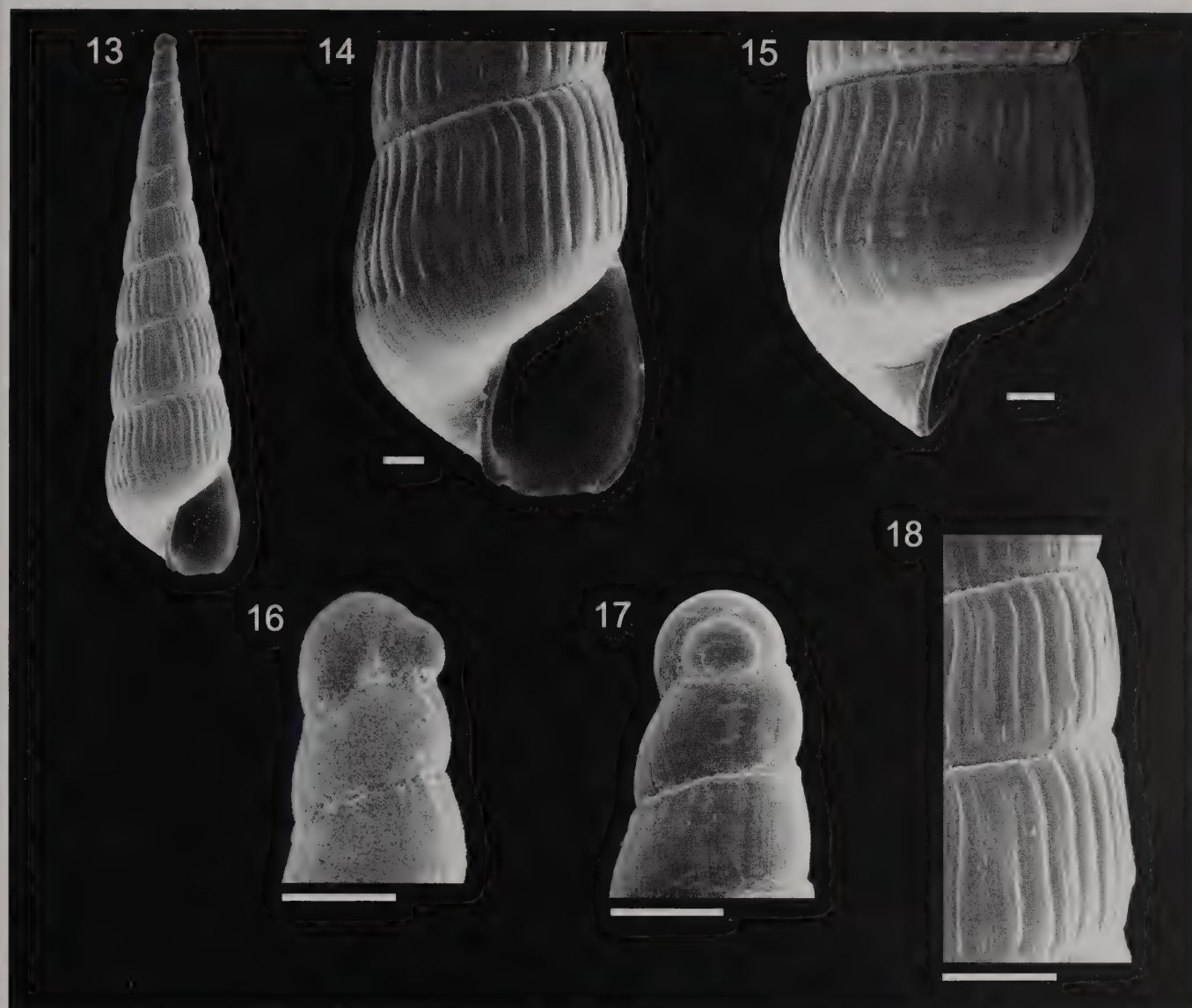
Additional material
IBUFRJ 11003, off Espírito Santo State, REVIZEE # EO 532 (19°43.857'S, 039°26.653'W, 359 m), Navio Thalassa coll. [1]; MORG 38641, off Santa Catarina (28°44'S, 047°38'W, 200 m), ii/1987, AS coll. [1].

Distribution
Coast of Espírito Santo to north coast of Rio de Janeiro State and Santa Catarina State.

Etymology
This species is named after the Brazilian Indian tribe Goytacaz (Portuguese term to the Brazilian Indian word Waitacá, great runners) that inhabited the land area in Campos Bay.

Remarks
Turbonilla goytacazi (figs 6-12) resembles *T. farinatiae* (figs 1-5) in the shape of the axial ribs, the degree of their projection over the base (figs 8, 9), and protoconch type (figs 11, 12). The species can be distinguished by the general shape of the shell, which is less conical and narrower in *T. goytacazi* (figs 6, 7) and by the yellow spiral band, absent in *T. farinatiae.*

Turbonilla farroupilha n. sp. (figs 13-18)

Description
Shell tall, strictly conical, with acuminate apex; color milk-white. Teleoconch whorls slightly pyriform in profile, with accentuated convexity in the anterior half, above the suture. Suture somewhat deep, delicately sinuous by ribs projection. Protoconch heterostrophic helicoid; diameter about 260 µm. Axial ribs orthocline or opisthocline, sinuous, slender and very close each other; not distinct on initial 3-4 whorls; summits of the ribs projected over anterior suture; 40 ribs on body whorl of holotype; interspaces very narrow, about half as wide as the ribs, ending abrupt-

Figs 13-18. *Turbonilla farroupilha* n. sp. 13, 14, 17, 18: holotype (MORG 41049); 15: paratype (IBUFRJ 11900); 16: paratype (MNHN). Fig. 13: whole shell (length 7.8 mm); figs 14, 15: last whorl; figs 16, 17: protoconch; fig. 18: detail of sculpture. Scale bars: 250 µm.
Figg. 13-18. *Turbonilla farroupilha* n. sp. 13, 14, 17, 18: olotipo (MORG 41049); 15: paratipo (IBUFRJ 11900); 16: paratipo (MNHN). Fig. 13: conchiglia intera (lunghezza 7,8 mm); figg. 14, 15: ultimo giro; figure 16, 17: protoconca; fig. 18: dettaglio della scultura. Scala di riferimento: 250 µm.

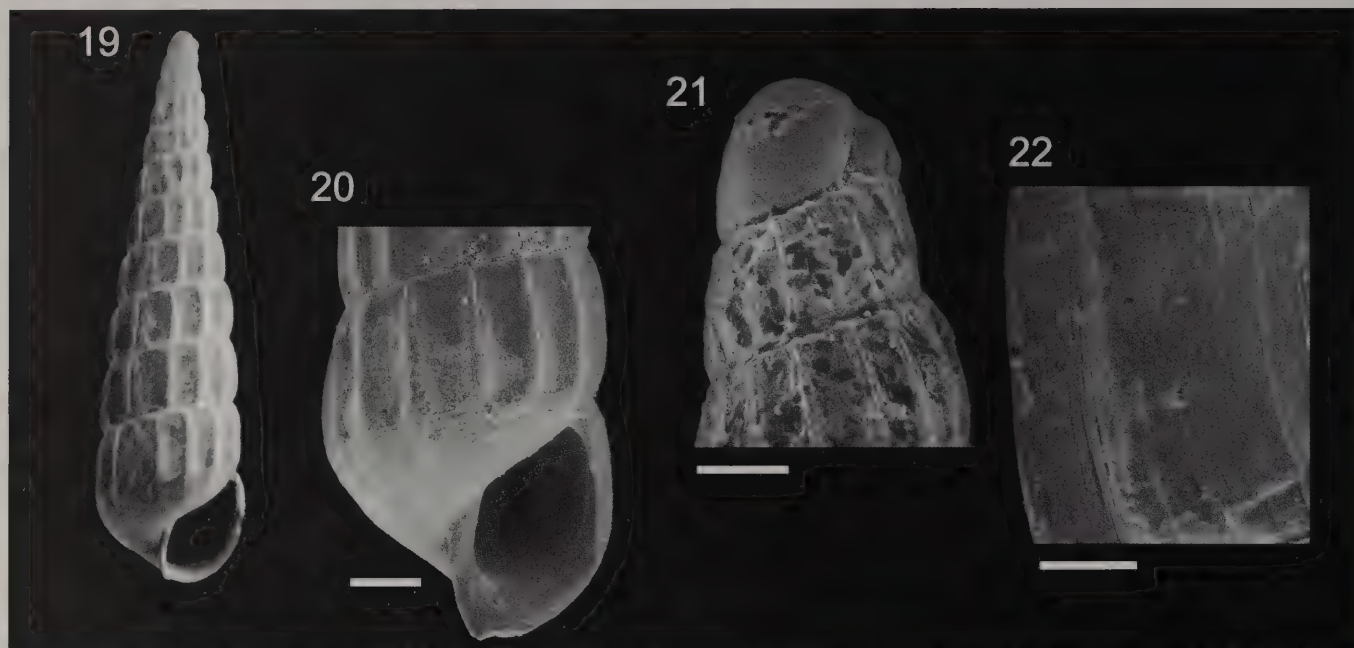
ly at periphery of last whorl and some distance posterior to the summit of the succeeding whorl, thus leaving a rather broad, plain band above the suture. Spiral sculpture absent, except for microscopic spiral striations. Base rounded, smooth. Aperture rhomboid, well rounded anteriorly. Columella obliquely arcuate, without fold. Outer lip thin. No umbilical fissure.

Dimensions
Holotype with 10.5 teleoconch whorls; height 7.8 mm; width 1.8 mm

Type material
Holotype: MORG 41049 off Rio Grande, Rio Grande do Sul State (42 m), iii/1972, AS coll.; Paratypes: MNRJ 8919; ANSP 410341; MORG 41049; MNHN, type locality; IBUFRJ 11900; MZSP 35859 Armação, Santa Catarina State, Daniel Forcelli leg.

Type locality
Off Rio Grande (42 m), Rio Grande do Sul State, south coast of Brazil.

Additional material
--Rio de Janeiro State: IBUFRJ 9423, Arquipélago de Santana, Macaé, v/1993, NOAG coll. [3]; --Santa Catarina State: IBUFRJ 9399, Armação, D.Forcelli leg. [1]; IBUFRJ 9410, CFVII # 6165 (23°02.8'S, 042°46'W, 56 m), 23/iii/1983, NOAS coll. [2]; --Rio Grande do Sul State: MORG 21914, off Rio Grande (42 m), iii/1972, AS coll. [5]; MORG 27031, Parcel do Carpinteiro, 25/xi/1988, AS coll. [6].

Distribution
Southeast-souht coast of Brazil (Rio de Janeiro, Santa Catarina and Rio Grande do Sul States).

Figs 19-22. *Turbonilla rhabdota* (Watson, 1886). 19: (IBUFRJ 8899); 20-22 (IBUFRJ 5229); Fig. 19: whole shell (length: 5.6 mm); fig. 20: last whorl; fig. 21: protoconch; fig. 22: detail of whorl. Scale bars: fig. 20: 300 µm; figs 21, 22: 100 µm.
Figg. 19-22. *Turbonilla rhabdota* (Watson, 1886). 19: (IBUFRJ 8899); 20-22 (IBUFRJ 5229); Fig. 19: conchiglia intera (lunghezza: 5,6 mm); fig. 20: ultimo giro; fig. 21: protoconca; fig. 22: dettaglio di un giro. Scala di riferimento: fig. 20: 300 µm; figg. 21, 22: 100 µm.

Etymology
This species is named after the "Guerra dos Farrapos", a civil war that took place in Rio Grande do Sul State (1835-1845).

Remarks
Turbonilla farroupilha is well characterized by its acuminate apex (fig. 13), and the sigmoid ribs which are very closely packed (figs 14, 15) and faint in the earlier whorls (figs 13, 16, 17).
The most similar species from the southwest Atlantic are *Turbonilla uruguayensis* Pilsbry, 1897 and *Turbonilla atypha* Bush, 1899. Both have a conical shell shape and lack spiral sculpture, and *T. uruguayensis* also bears faint ribs on the earlier whorls. However, in *T. farroupilha*, the earlier whorls narrow abruptly, giving rise to an acuminate apex (fig. 13), and the ribs are more sinuous, slender, and closely packed (figs 14, 15). *Turbonilla turris* (d'Orbigny, 1840), the holotype of which was illustrated by Pimenta & Absalão (2001), has the same kind of microscopic spiral striae and also a somewhat acuminate apex, but the ribs and the profile of the whorls are straight.

Turbonilla rhabdota (Watson, 1886) (figs 19-22)

Odostomia (Turbonilla) rhabdota Watson, 1886. Challenger Reports, Zoology 15: 491-492, pl. 32, fig. 4.
Turbonilla rhabdota (Watson, 1886): Odé (1996: 56).

Types
Holotype: presumably at BMNH, not examined.

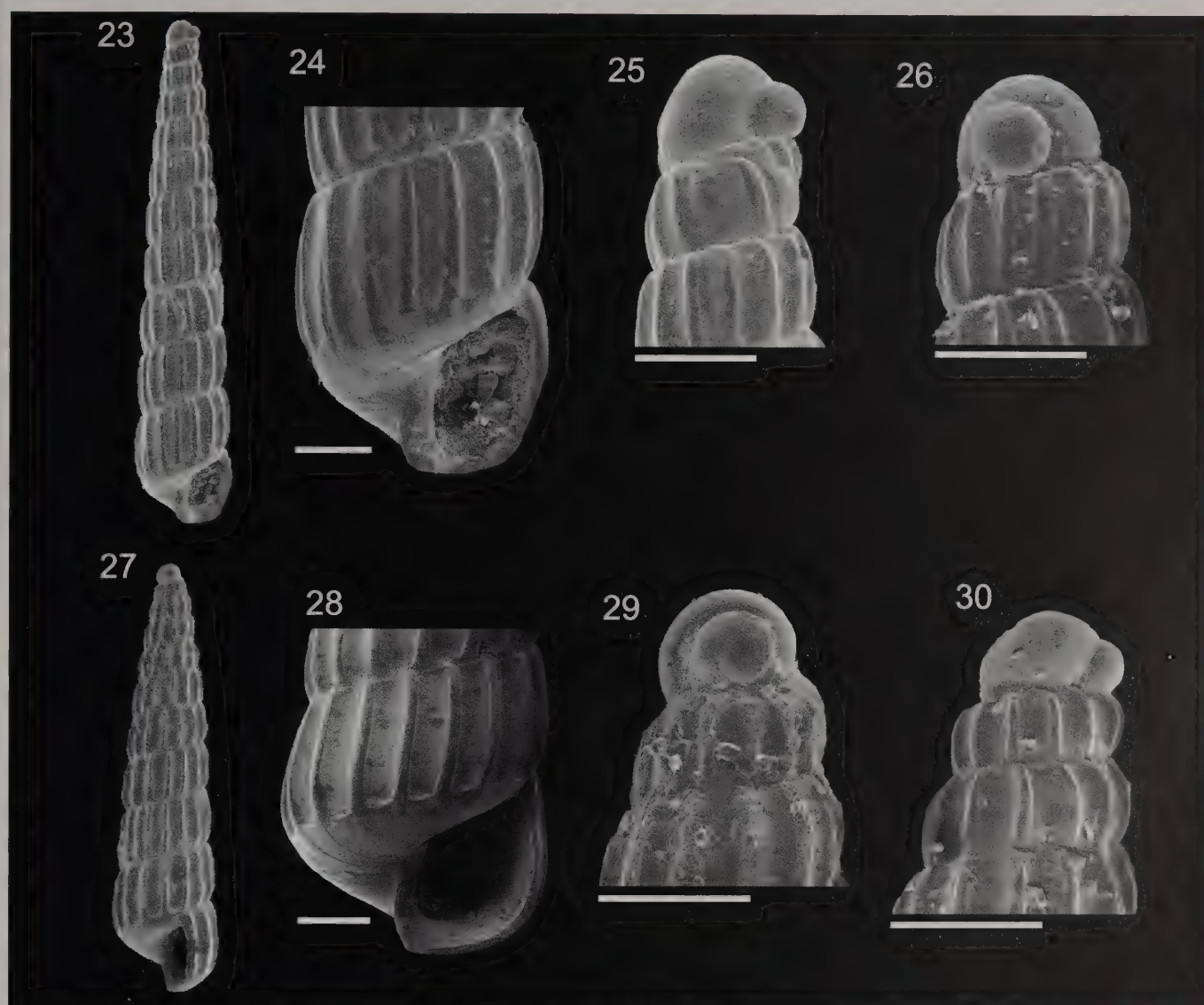
Type locality
Off Cuebra Island, West Indies (Chalenger St. 24: 18°38'30"N, 065°05'30"W, 700 m).

Material examined
--Pará State: IBUFRJ 8898, AMASSEDS # 4134 (off Pará), x/1991, RVCI coll. [1]; --Espírito Santo State: IBUFRJ 9009, off Camburi, 15/x/1997, Eq.Zoo. coll. [1]; IBUFRJ 5929, off Camburi #11A, 18/iii/1991, Eq.Zoo. coll. [2]; --Rio de Janeiro State: IBUFRJ 8899, Arquipélago de Santana, Macaé, v/1993, NOAG coll. [4]; --São Paulo State: MZSP 30908, Praia do Goes, Ilha de Santo Amaro, 04/i/21970, J.Vaz coll. [2]; MORG 38613, off São Vicente, vii/1974, J. Cololle coll. [1]; --Paraná State: MORG 15927, off Camboriu, viii/1971, E.Vokes & H.Vokes coll. [2]; MZSP28862, Praia de Caiobá, 15/xii/1948, J.P.Carvalho coll. [2].

Distribution
West Indies; north, southeast and south coasts of Brazil (Pará, Espírito Santo, Rio de Janeiro, São Paulo and Paraná States).

Remarks
Odé (1996) listed *T. valida* Verrill & Bush, 1900 and *Turbonilla kymatoessa* (Watson, 1886) in synonymy with *T. rhabdota*. We do not agree with this statement. *Turbonilla valida* has more convex whorls, and its ribs are not straight and do not have the same characteristics of sharpness and spacing as *T. rhabdota*. *Turbonilla kymatoessa* has spiral striae in the interspaces and a planispiral protoconch (Watson, 1886).

Turbonilla lepta n sp. (figs 23-26)

Description
Shell small, moderately tall, very slender, elongate-conic to almost cylindrical in shape; fresh shells transparent, older ones white. Teleoconch whorls somewhat straight in profile. Suture

Figs. 23-26. *Turbonilla lepta* n. sp. 23-25: holotype (MNRJ 8939); 26: paratype (MNHN). Fig. 23: whole shell (length 4.6 mm); fig. 24: last whorl; figs 25, 26:protoconch. Scale bars: 200 µm.

Figs 27-30. *Turbonilla parviscymna* n. sp. 27-29: holotype (MNRJ 8922); 30: paratype (IBUFRJ 11902). Fig. 27: whole shell (length 3.8 mm); fig. 28: last whorl; figs 29, 30:protoconch. Scale bars: 200 µm.

Figg. 23-26. *Turbonilla lepta* n. sp. 23-25: olotipo (MNRJ 8939); 26: paratipo (MNHN). Fig. 23: conchiglia intera (lunghezza: 4,6 mm); fig. 24: ultimo giro; figg. 25, 26: protoconca. Scala di riferimento: 200 µm.

Figg. 27-30. *Turbonilla parviscymna* n. sp. 27-29: olotipo (MNRJ 8922); 30: paratipo (IBUFRJ 11902). Fig. 27: conchiglia intera (lunghezza 3,8 mm); fig. 28: ultimo giro; figg. 29, 30: protoconca. Scala di riferimento: 200 µm.

shallow, straight. Protoconch heterostrophic heliocoid; diameter about 230 µm. Axial ribs straight, slender orthocline; 16 on body whorl of holotype; interspaces about as wide as the ribs, ending abruptly at periphery of last whorl. Spiral sculpture absent. Base rounded, smooth. Aperture rhomboid. Columella straight, without fold. Outer lip thin. No umbilical fissure.

Dimensions

Holotype with 10.5 teleoconch whorls; height 4.6 mm; width 0.8 mm.

Type material

Holotype: MNRJ 8939, off Cabo Frio, Rio de Janeiro State, CFVII # 6147 (22°53.7'S, 041°50.5'W, 50 m), 24/iii/1983, NOAS coll.; Paratypes: IBUFRJ 11901; MORG 41039; MZSP 35851, type locality; MNHN off Espírito Santo State; ANSP 410342, off north coast of Rio de Janeiro State, REVIZEE # D3 (22°52'S, 041°09'W, 80 m), 23/ii/1996, NOAN coll.; MNRJ 8940, Bacia de Campos, Rio de Janeiro State (22°15'36"S, 040°20'16"S, 100 m).

Type locality

Off Cabo Frio, north coast of Rio de Janeiro State (22°53.7'S, 041°50.5'W, 50 m), southeast coast of Brazil.

Additional material

--Espírito Santo State: IBUFRJ 8907, off Espírito Santo State [2]; -- Rio de Janeiro State: IBUFRJ 9440, off Cabo Frio, CFVII

6174 (23°16.8'S, 043°02.7'W, 92 m), 29/iii/1983, NOAS coll. [1]; IBUFRJ 9441, off Cabo Frio, CFVII # 6147 (22°53.7'S, 041°50.5'W, 50 m), 24/iii/1983, NOAS coll. [5]; IBUFRJ 10350, REVIZEE # D3 (22°52'S, 041°09'W, 80 m), 23/ii/1996, NOAN coll. [2].

Distribution
Southeast coast of Brazil (Espírito Santo and Rio de Janeiro States).

Etymology
This species is named after its slender, thin shell (*leptos*, Gr. = fine, small, thin, delicate).

Remarks
Turbonilla lepta (figs 23-26) is similar in dimensions and sculpture to *Turbonilla coomansi* Aartsen, 1993, with the same protoconch type and number of whorls (figs 25, 26). *Turbonilla lepta*, however, is more slender, tall, and has an almost cylindrical shape (fig. 23), while *T. coomansi* is more conical. Moreover, *T. coomansi* has somewhat curved and sharper axial ribs and convex whorls profile, while in *T. lepta*, the ribs and whorls profile are straight (fig. 23).

Turbonilla parviscymna n. sp. (figs 27-30)

Description
Shell small, conical; color white. Teleoconch whorls straight. Suture shallow, slightly sinuous by ribs projection. Protoconch heterostrophic helicoid; diameter about 200 µm. Axial ribs slender, straight, orthocline or slightly opisthocline; 17 on body whorl of holotype; interspaces about twice as wide as the ribs, ending abruptly at periphery of last whorl. Spiral sculpture absent. Base rounded, smooth. Aperture rhomboid. Columella straight, without fold. Outer lip thin. No umbilical fissure.

Dimensions
Holotype with 8.25 teleoconch whorls; height 3.8 mm; width 0.7 mm.

Type material
Holotype: MNRJ 8922, off Pará State, AMASSEDS # 3209 (01°20.93'N, 048°00.20'W, 53 m), RVCI coll.; Paratypes: ANSP 410343; MNHN; IBUFRJ 11902, type locality.

Type locality
Off Pará State, north coast of Brazil, AMASSEDS # 3209 (01°20.93'N, 048°00.20'W, 53 m).

Distribution
Known from type locality only.

Etymology
This species is named after its small protoconch in relation to shell width (parvus, L. = little; scymnus, L. = a young animal).

Remarks
Turbonilla parviscymna (figs 27-30) has the same sculpture and protoconch type (figs 29, 30) as *T. lepta* (figs 25, 26), but can be easily distinguished by its strictly conical shape (fig. 27), with a larger shell width in relation to the shell length, while *T. lepta* has an almost cylindrical shell shape, being very slender and tall (fig. 23).

Turbonilla fluminensis n. sp. (figs 31-34)

Description
Shell tall, slender, slightly conical; color white. Teleoconch whorls convex in profile. Suture somewhat deep, straight. Protoconch heterostrophic helicoid; diameter about 300 µm. Axial ribs slender, slightly sinuous, opisthocline; ending abruptly at periphery of last whorl; 18 on body whorl of holotype; interspaces as wide as the ribs. Spiral sculpture absent. Base rounded, smooth. Aperture rhomboid. Columella obliquely straight, without fold. Outer lip thin. No umbilical fissure.

Dimensions
Holotype with 10.25 teleoconch whorls; height 4.7 mm; width 0.9 mm.

Type material
Holotype: MNRJ 8943, off Macaé, Rio de Janeiro State, REVIZEE # D1 (22°48'S, 041°09'W, 69 m), 23/ii/1996, NOAN coll.; Paratypes: ZMA 4.02.021; MNRJ 8923; MZSP 35861, off north coast of Rio de Janeiro State, REVIZEE # D3 (22°52'S, 041°09'W, 80 m), 23/ii/1996, NOAN coll.; ANSP 410344, type locality; IBUFRJ 11903, Bacia de Campos, Rio de Janeiro State (22°47'47"S, 40°45'32"W), NOAG coll.; MNRJ 8924, Bacia de Campos, Rio de Janeiro State (22°15'20"S, 040°19'54"W, 100 m); MORG 41040, Bacia de Campos, Rio de Janeiro State (22°15'07"S, 040°19'56"W, 95 m); MNHN Espírito Santo I # 6446, 22/viii/1984, NOAS coll.

Type locality
Off Macaé (22°48'S, 041°09'W), Rio de Janeiro State, southeast coast of Brazil.

Additional material
-- Rio de Janeiro State: IBUFRJ 9443, off Cabo Frio, CFVII # 6147 (22°53,7'S, 041°50,5'W, 50 m), 24/iii/1983, NOAS coll. [1]; IBUFRJ 10349, REVIZEE # D3 (22°52'S, 041°09'W, 80 m), 23/ii/1996, NOAN coll. [1]; IBUFRJ 8906, off Bacia de Campos (22°15'25"S, 040°19'39" W, 100 m), NOAG coll. [1].

Distribution
Southeast coast of Brazil (off Espírito Santo and Rio de Janeiro States).

Etymology
"Fluminense" is the general determination to those people that was born in Rio de Janeiro State, Brazil.

Remarks

Turbonilla fluminensis (figs 31-34) is very similar in shell shape and sculpture to *Turbonilla coomansi* Aartsen, 1993, *Turbonilla penistoni* Bush, 1899, and *Turbonilla enna* Bartsch, 1927. However, *T. fluminensis* can be distinguished by its larger protoconch (mean diameter 300 µm) which has about three whorls well projected in a helicoid type (figs 33, 34). The helicoid protoconchs of *T. coomansi* and *T. penistoni* bear about two whorls of medium size (mean diameters 210 and 200 µm, respectively), and *T. enna* has a planispiral protoconch (figs 39, 40).

The whorls profile of *T. fluminensis* (figs 31, 32) is more regularly convex than *T. penistoni* (the holotype was illustrated by Absalão & Pimenta, 1999). The latter has a somewhat sinuous whorl profile, with the ribs projecting over the anterior suture.

***Turbonilla* aff. *enna* Bartsch**, 1927 (figs.35-40)

Turbonilla enna Bartsch in Dall, 1927: 81-82; Odé (1996: 40).

Type locality

Off Fernandina, Florida (530 m).

Types

Holotype: USNM 360175; paratype: USNM 360176.

Material examined

The holotype and: --Rio de Janeiro State: IBUFRJ 9465, off Cabo Frio, CFVII # 6147 (22°53.7'S, 041°50.5'W, 50 m), 24/iii/1983, NOAS coll. [2]; IBUFRJ 9466, off Prainha, Arraila do Cabo, 1989, T.Almeida coll. [1]; IBUFRJ 10351, REVIZEE # D3 (22°52'S, 041°09'W, 80 m), 23/ii/1996, NOAN coll. [10]; IBUFRJ 7202, CFVII # 6194 (24°03.6'S, 044°07.6'W, 134 m), 01/iv/1983, NOAS coll. [2]; IBUFRJ 9463, off Bacia de Campos (22°15'20"S, 040°19'45"W, 100 m), NOAG coll. [4]; IBUFRJ 9464, Bacia de Campos (22°15'26"S, 040°19'41"W, 105 m), NOAG coll. [1].

Distribution

Fernandina (Florida); southeast coast of Brazil (off Rio de Janeiro State).

Remarks

The ribs of the Brazilian specimens determined herein as *Turbonilla* aff. *enna* Bartsch, 1927 (figs 36-40) are stronger and less straight than in the holotype (fig. 35). Our determination of these specimens as *T.* aff. *enna* is based on the strong similarity in the protoconch type and general shell shape. Both the holotype and the Brazilian specimens have very similar dimensions and convex whorls. The most striking similarity, however, lies in the protoconch, which is planispiral (figs 35, 39, 40) in contrast to all other species without spiral sculpture discussed herein (*T. lepta, T. parviscymna, T. penistoni, T. fluminensis, T. coomansi, and T. unilirata* Bush, 1899).

Turbonilla zulmae Pimenta & Absalão, 1998 (figs 41-44)

Turbonilla zulmae Pimenta & Absalão, 1998: 63 nom. nov. for *Turbonilla elongata* Castellanos, 1982 non Pease, 1967.

Turbonilla elongata Castellanos, 1982: 66-67, fig. 8; Farinati (1993: 301, fig. 5).

Type locality

Pto. Quequén (40°25'S, 61°34'W, 30 m), Argentina.

Types

Holotype not located (probably lost). Paratypes: MACN 30807, Pto. Quequén, Est. Hidrobiologica, vii/1937, Carcelles, Parodiz coll. [13]; MACN 34015, Est. 16 del Shinkai Marú (38°31'S, 057°25'W, 50 m)[1].

Material examined

--Rio de Janeiro State: IBUFRJ 11896, off Cabiúnas, 21/iv/1993, NOAG coll. [1]; --Rio Grande do Sul State: MORG 17858, off Chuí, # 405 (65 m), 29/x/1968, NOWB coll. [4]; MZSP19301, off Chuí (34°32'S, 052°27'W, 65 m), 19/x/1968, NOWB coll. [5];

Remarks

Turbonilla zulmae Pimenta & Absalão, 1998 was proposed as a new name for *Turbonilla elongata* Castellanos, 1982 non Pease, 1967. Although the holotype of this species is probably lost, we were able to examine its paratypes, on which we base our discussion (fig. 41). This species is very similar to *Turbonilla atypha* Bush, 1899, but is more slender, with more marked and numerous axial ribs.

The specimens from Brazil (figs 42-44) have very similar general shell shape and axial ribs, but are less slender and have a more convex whorls outline than the illustrated paratype of *T. zulmae* (fig. 41).

***Turbonilla* aff. *unilirata* Bush**, 1899 (figs 45-48)

Turbonilla unilirata Bush, 1899: 165, pl. 8, fig. 6; Warmke & Abbott (1962: 149); Jong & Coomans (1988: 127, pl. 20, figs. 660); Johnson (1989: 72); Odé (1996: 60); Absalão & Pimenta (1999: 83, fig. 11).

Turbonilla (Pyrgiscus) unilirata Bush, 1899: vokes & vokes (1983: 33, pl. 31, fig. 8).

Turbonilla cf. *unilirata* Bush, 1889: Diaz & Puyana (1994: 239, fig. 957).

Type locality

Saint Thomas, West Indies.

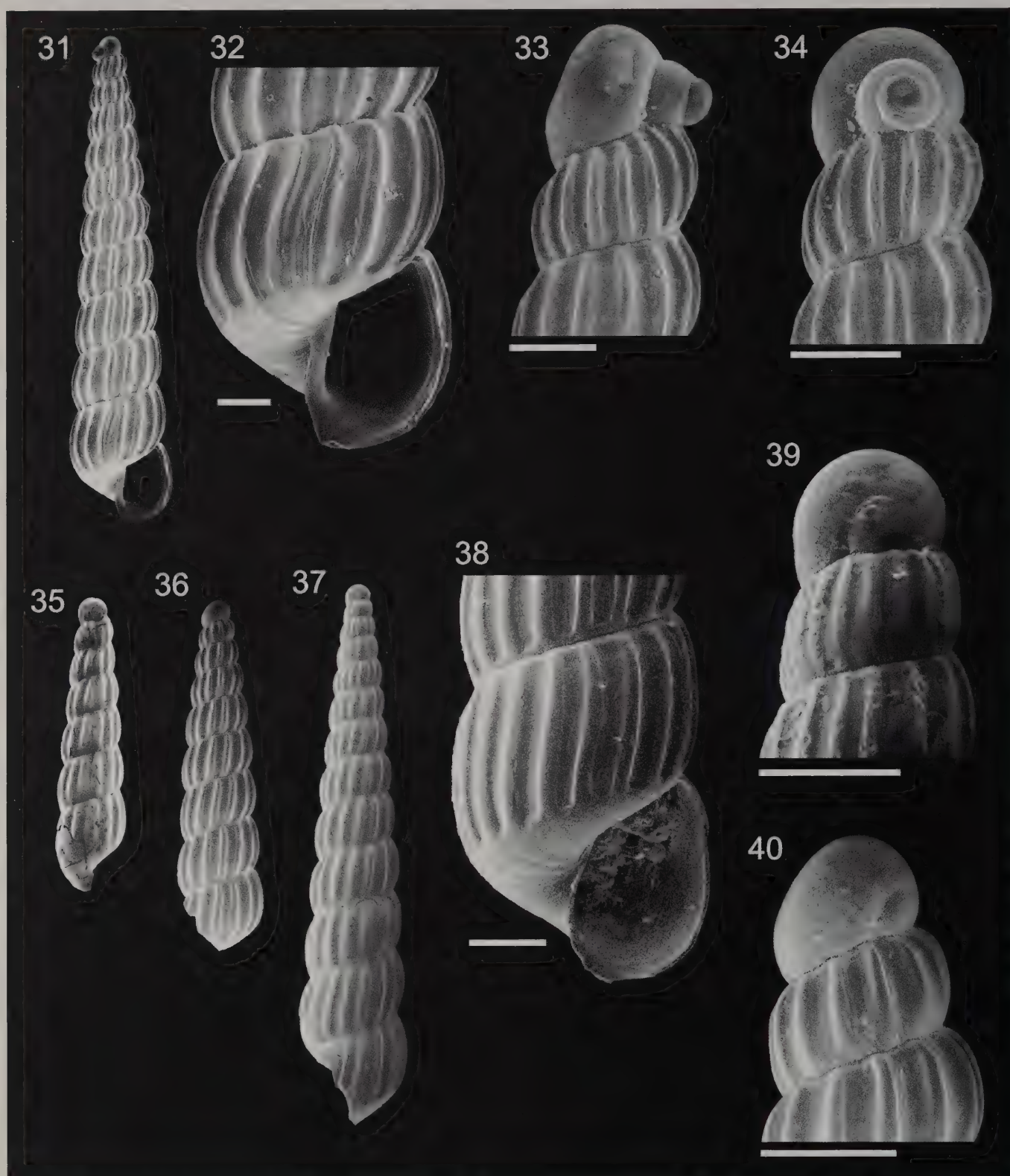
Types

Holotype by original designation: ANSP 79010; paratypes: ANSP 79010 (three specimens, missing).

Material examined

The holotype and: MZSP 30907, off Rio de Janeiro State, PAD-CT 6627 (23°57.990'S, 043°52.560'W, 133 m) [5].

Distribution

West Indies; southeast coast of Brazil (off Rio de Janeiro State).

Figs 31-34. *Turbonilla fluminensis* n. sp. 31, 32: holotype (MNRJ 8943); 33, 34: paratype (MORG 41040). Fig. 31: whole shell (length 4.7 mm); fig. 32: last whorl; figs 33, 34: protoconch. Scale bars: 200 µm.

Figs 35-40. *Turbonilla* aff. *enna* Bartsch, 1927. 35: holotype (USNM 360175); 36-40 (IBUFRJ 10351). Figs 35-37: whole shells (lengths: 35: 4.2 mm, 36: 2.8 mm, 37: 5.0 mm); fig. 38: last whorl; figs 39, 40: protoconch. Scale bars: 200 µm.

Figg. 31-34. *Turbonilla fluminensis* n. sp. 31, 32: olotipo (MNRJ 8943); 33, 34: paratipo (MORG 41040). Fig. 31: conchiglia intera (lunghezza 4,7 mm); fig. 32: ultimo giro; figure 33, 34: protoconca. Scala di riferimento: 200 µm.

Figg. 35-40. *Turbonilla* aff. *enna* Bartsch, 1927. 35: olotipo (USNM 360175); 36-40 (IBUFRJ 10351). Figg. 35-37: conchiglie intere (lunghezza: 35: 4,2 mm, 36: 2,8 mm, 37: 5,0 mm); fig. 38: ultimo giro; figure 39, 40: protoconca. Scala di riferimento: 200 µm..

Remarks

For description, see BUSH (1899) and ABSALÃO & PIMENTA (1999). *Turbonilla unilirata* lacks spiral sculpturing, but can be clearly distinguished by a single spiral cord just below the suture, as seen in the holotype (fig. 45). As discussed by ABSALÃO & PIMENTA (1999: 83, fig. 12), a possible intraspecific variation of *T. unilirata* is characterized by shells with a more tapered outline and fewer axial ribs, with larger interspaces. The Brazilian specimens studied herein (figs 46-48) resemble this variation more closely, with the same tapered whorls and ribs pattern (fig. 46). However, the spiral cord (figs 46, 47) is not as marked as in the holotype of *T. unilirata* (fig. 45) and in its variation (ABSALÃO & PIMENTA, 1999: fig, 12), which led us to determine these specimens as *T.* aff. *unilirata*.

Turbonilla krebsii (Mörch, 1875) (figs 49-54)

Chemnitzia (Elusa) krebsii Mörch, 1875: 159-160.
Turbonilla krebsii (Mörch, 1875): JONG & COOMANS (1988: 128, pl. 20, fig. 668); ODÉ (1996: 47); REDFERN (2001: 150, pl. 67, figs 626A, 626B, 626C).
Turbonilla palmerae Aguayo & Jaume, 1936. synonymized by JONG & COOMANS (1988)

Type locality

Saint Thomas.

Types

Two syntypes: ANSP 19983.

Material examined

The types above and: Grand Bahama Islands: ANSP 369280, Southwest Corner, Sweetings Cay, (26°36'45"N, 077°54'30"W), J.Worsfold coll. [2]; ANSP 370037, Fleming Road, Mosquito Point, (26°37'30"N, 078°54'W), J.Worsfold coll. [2]; ANSP 371818, 4 miles of Burmah Oil, (26°40'N, 078°09'W), J.Worsfold coll. [47]; --Bahia State: IBUFRJ 8860, off Bahia State, L.Trinchão coll. [1]; MNHN, Rio Vermelho, São Salvador, 1989, P.Maestrati coll. [2].

Distribution

Saint Thomas; Bahama Islands; northeast coast of Brazil (off Bahia State).

Remarks

Turbonilla krebsii (Mörch, 1875) is characterized by its pupoid shell (figs 49, 50), golden brown shell color, and spiral sculpture of about six rectangular pits in the interspaces (figs 51, 52). In contrast to these characters, which show very little variation, the axial ribs may be very faint in the last whorl, as in the holotype (fig. 49).

Turbonilla pupoides (d'Orbigny, 1842) (figs 55-60)

Chemnitzia pupoides d'Orbigny, 1842: 224, 225. Atlas (1853): pl. 16, fig 32, 36.
Turbonilla pupoides var. *ischna* Bush, 1899: 153-154, pl. 8, fig. 5; ABSALÃO & PIMENTA (1989: 82, fig. 21).
Pyrgostelis (Mormula) pupoides var. *ischna* (Bush, 1899): VERRILL & BUSH (1990: 351, pl. 65, figs. 21, 22).
Turbonilla (Pyrgiscus) pupoides (d'Orbigny, 1842): VOKES & VOKES (1983: 33, pl. 31, fig. 13).
Turbonilla pupoides ischna Bush, 1899: JONHSON (1898: 44).
Turbonilla pupoides (d'Orbigny, 1842): WARMKE & ABBOTT (1962: 148, pl. 26, fig. d); JONG & COOMANS (1988: 130, pl. 20, fig. 676); DIAZ & PUYANA (1994: 238, fig. 950); ODÉ (1996: 54); REDFERN (2001: 148, pl. 66, figs 616A, 616B).
Chemnitzia flavocincta C.B.Adams (1850). synonymyzed by JONG & COOMANS (1988).

Type Locality

Cuba.

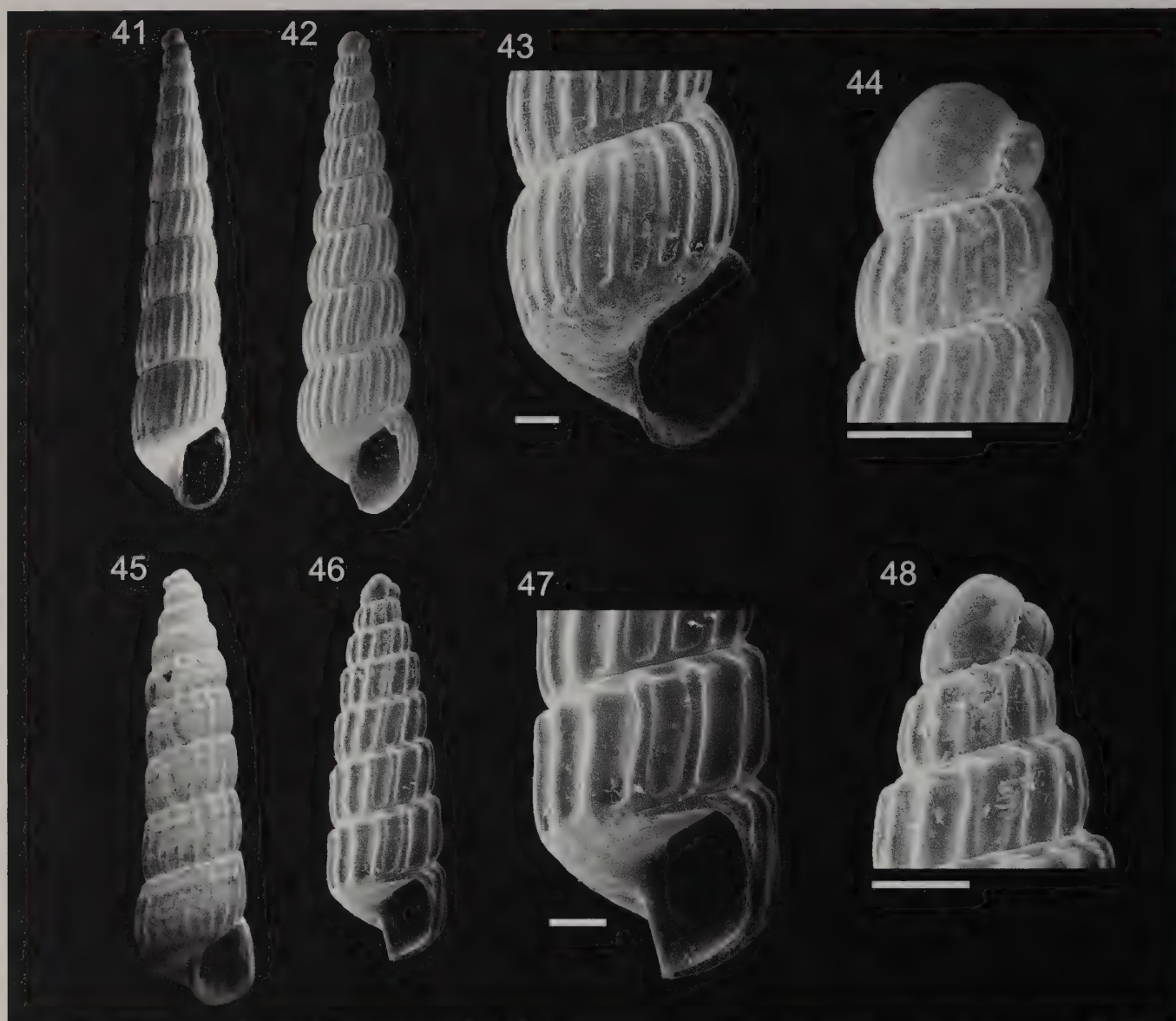
Types

Syntypes: BMNH 1854.10.4.148.

Material Examined

The types and: holotype of *Turbonilla pupoides* var. *ischna* Bush, 1899: ANSP 79014, no locality data; three paratypes of *Turbonilla pupoides* var. *ischna* Bush, 1899: ANSP 372507, no locality data; -- Grand Bahama Island: ANSP 371277, Dead Man's Reef [20]; --Bermuda: MORG 17506, off Bermuda [3]; --Bahia State: MORG 23909, Abrolhos bank, i/1985, Eq.MORG coll. [1]; MZSP28864, Abrolhos bank, v/1958, L.Pini Neto coll. [2]; MORG 23908, Abrolhos bank, i/1985, Eq. MORG coll. [90]; MORG 16401, off Itapuã, 17/vii/1967, E. Rios coll. [14]; IBUFRJ 11068, off Guarajuba, Itapuã, 1989, L.Trinchão coll. [4]; -- Espírito Santo State: IBUFRJ 8864, REVIZEE # VV38 (19°28'S, 038°22'W), 29/ii/1996, NOAN coll. [5]; IBUFRJ 7542, GEOMAR XII # 21 (20°49'80"S, 040°16'20"W, 37 m), 26/viii/1979, NOAC coll. [2]; IBUFRJ 7541, GEOMAR XII # 34 (21°15'30"S, 040°20'40"W, 46 m), 27/viii/1979, NOAC coll. [1]; IBUFRJ 8627, off Piúma, 1993 [5]; IBUFRJ 8865, off Espírito Santo State, 23/vi/1993 [2]; IBUFRJ 9779, REVIZEE # VV16 (21°10'S, 040°27'W, 27.65 m), 26/ii/1996, NOAN coll. [1]; IBUFRJ 10219, REVIZEE # C62 (20°30'02"S, 037°28'51"W, 96 m), 25/iv/1996, NOAN coll. [1]; IBUFRJ 10316, off Aracruz, 01/viii/1987 [1]; IBUFRJ 8862, off Espírito Santo State [3]; -- Rio de Janeiro State: IBUFRJ 7548, GEOMAR XII # 41 (21°21'S, 040°53'W, 12 m), viii/1979, NOAC coll. [2]; IBUFRJ 7543, GEOMAR XII # 76 (21°57'60"S, 040°51'W, 15 m), 28/viii/1979, NOAC coll. [1]; IBUFRJ 8863, REVIZEE # D1 (22°48'S, 041°09'W), 23/ii/1996, NOAN coll. [1]; IBUFRJ 7641, GEOMAR XII # 97 (22°07'50"S, 040°20'50"W, 67 m), 29/viii/1979, NOAC coll. [3].

Distribution

Cuba; Bahama Island; Yucatan Peninsula, Mexico; Colombian Caribbean; northeast and southeast coasts of Brazil (Bahia, Espírito Santo and Rio de Janeiro States).

Figs 41-44. *Turbonilla zulmae* Pimenta & Absalão, 1998. 41: paratype (MACN 34051); 42, 44 (MZSP 19301); 43 (IBUFRJ 7216). Figs 41, 42: whole shells (lengths: 41: 4.2 mm; 42: 4.0 mm); fig. 43: last whorl; fig. 44: protoconch. Scale bars: 200 µm.
Figs 45-48. *Turbonilla aff. unilirata* Bush, 1899. 45: holotype of *T. unilirata* (ANSP 79010); 46-48 (MZSP 30907). Figg. 45, 46: whole shells (lengths: 45: 2.8 mm, 46: 2.8 mm); 47: last whorl; 48: protoconch. Scale bars: 200 µm.
Figg. 41-44. *Turbonilla zulmae* Pimenta & Absalão, 1998. 41: paratipo (MACN 34051); 42, 44 (MZSP 19301); 43 (IBUFRJ 7216). Figg. 41, 42: conchiglie intere (lunghezza: 41: 4,2 mm; 42: 4,0 mm); fig. 43: ultimo giro; fig. 44: protoconca. Scala di riferimento: 200 µm.
Figg. 45-48. *Turbonilla aff. unilirata* Bush, 1899. 45: olotipo di *T. unilirata* (ANSP 79010); 46-48 (MZSP 30907). Figg. 45, 46: conchiglie intere (lunghezze: 45: 2,8 mm, 46: 2,8 mm); 47: ultimo giro; 48: protoconca. Scala di riferimento: 200 µm.

Remarks

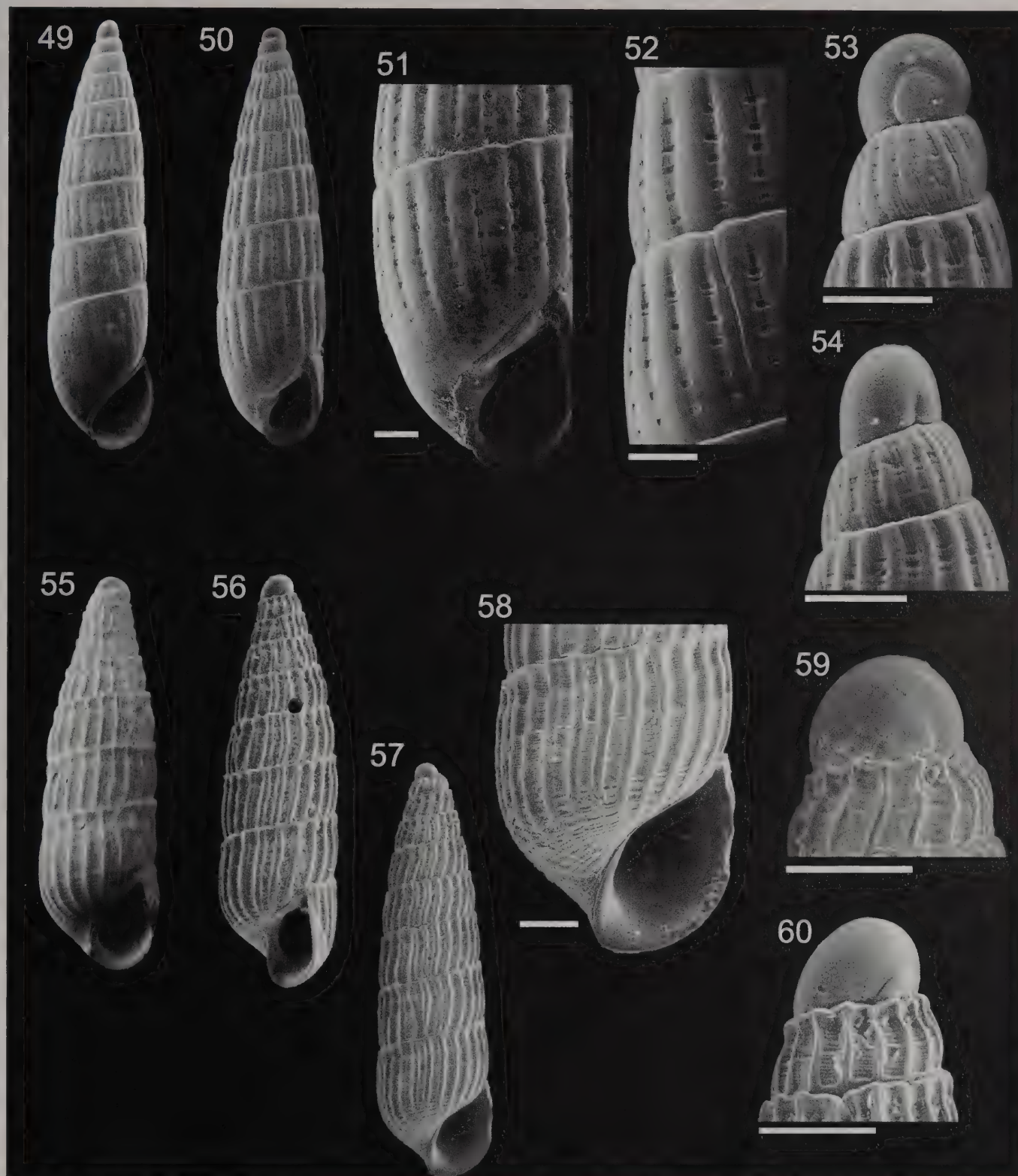
Turbonilla pupoides (figs 55-60) is easily distinguished from the other *Turbonilla* species in the western Atlantic by its pupoid shell (figs 55-57) and spiral sculpture (fig. 58), with two wider striae, one in the middle of the whorl and another above the suture, and many fine, crowded spirals in the interspaces.

Absalão & Pimenta (1999) considered *Turbonilla pupoides* var. ischna Bush, 1899 as a synonym of *Turbonilla pupoides*. Based on the abundant material of this species studied herein, we could verify that the shell described by Bush (1899) is part of an intraspecific variation of *T. pupoides*, especially the shape of the shell, which may be somewhat slender in some specimens (fig. 57).

Turbonilla pupoides is very common along the Brazilian coast, but does not reach localities below 23o S. It is especially well represented off the coast of Bahia State, but is also present off the states of Rio de Janeiro and Espírito Santo. There are many other records from several localities in the Caribbean region (Bush, 1899; Verrill & Bush, 1900; Vokes & Vokes, 1983; Warmke & Abbott, 1964; Diaz & Puyana, 1994).

Turbonilla aracruzensis n. sp. (figs 61-65)

Description

Shell moderately tall, slender, conical; color light brown. Teleo-

Figs 49-54. *Turbonilla krebsii* (Mörch, 1875). 49: syntype (ANSP 19983); 50, 51 (IBUFRJ 8860); 52-54 (MNHN). Figs 49, 50: whole shells (lengths: 49: 4.1 mm, 50: 3.8 mm); fig. 51: last whorl; fig. 52: detail of sculpture; figs 53, 54: protoconch. Scale bars: 200 µm.

Figs 55-60. *Turbonilla pupoides* (d'Orbigny, 1842). 55: syntype (BMNH 1854.10.4.148). 56-60: (MORG 23908). Figs 55-57: whole shells (lengths: 55: 2.5 mm, 56: 3.0 mm, 57: 3.2 mm); fig. 58: last whorl, figs 59, 60: protoconch. Scale bars: 200µm.

Figg. 49-54. *Turbonilla krebsii* (Mörch, 1875). 49: sintipo (ANSP 19983); 50, 51 (IBUFRJ 8860); 52-54 (MNHN). Figure 49, 50: conchiglia intera (lunghezza: 49: 4,1 mm, 50: 3,8 mm); fig. 51: ultimo giro; fig. 52: dettaglio della scultura; figg. 53, 54: protoconca. Scala di riferimento: 200 µm.

Figg. 55-60. *Turbonilla pupoides* (d'Orbigny, 1842). 55: sintipo (BMNH 1854.10.4.148). 56-60: (MORG 23908). Figg. 55-57: conchiglie intere (lunghezze: 55: 2,5 mm, 56: 3,0 mm, 57: 3,2 mm); fig. 58: ultimo giro, figure 59, 60: protoconca. Scala di riferimento: 200 µm.

conch whorls slightly convex in profile. Suture shallow and straight. Protoconch heterostrophic planispiral; diameter about 360 µm. Axial ribs low, straight, orthocline or slightly opisthocline, becoming evanescent before reaching anterior suture; fairly distinct on first whorl; 20 on body whorl of holotype; interspaces narrow, heath the width of the ribs. Spiral sculpture formed by about 20 rows of very thin striae irregularly spaced. Base elongate, with evanescent ribs and very thin spirals. Aperture pyriform. Columella somewhat arcuate, without fold. Outer lip thin. No umbilical fissure.

Dimensions
Holotype with 8.5 teleoconch whorls; height 5.4 mm; width 1.2 mm.

Type material
Holotype: MNRJ 8928, Aracruz, Espírito Santo State, viii/1987; Paratypes: ANSP 410346, off Espírito Santo State, REVIZEE # VV16 (21°10'S, 040°27'W, 27.65 m), 26/ii/1996, NOAN coll.; IBUFRJ 11904, off Macaé, Rio de Janeiro State, REVIZEE # D1 (22°48'S, 041°09'W, 69 m), 23/ii/1996, NOAN coll.; MNHN; ZMA 4.02.022, Cabiúnas, Espírito Santo State, 20/iv/1993, NOAG coll.; MNRJ 8921, Camburi, Espírito Santo State, 12/ii/1987, Eq.Zoo. coll.; MORG 41041, Camburi, Espírito Santo State, 30/x/1986, Eq.Zoo. coll.; MNRJ 8929, type locality; MZSP 35850, Arquipélago de Santana, Macaé, Rio de Janeiro State, v/1993, NOAG coll.

Type locality
Off Aracruz, Espírito Santo State, southeast coast of Brazil.

Additional material
-- Espírito Santo State: IBUFRJ 10315 off Aracruz, viii/1987, V.Abud coll. [1]; IBUFRJ 8934 Camburi, 14/iii/1986, Eq.Zoo. coll. [1]; IBUFRJ 10298 off Cabiúnas, 20/iv/1993, NOAG coll. [5]; IBUFRJ 10307 off Cabiúnas, 21/iv/1993, NOAG coll. [3]; --Rio de Janeiro State: MORG 27884, off Cabo Frio, 2/xii/1986, NOAS coll. [1]; IBUFRJ 8931, Arquipélago de Santana, Macaé, v/1993, NOAG coll. [1]; --Rio Grande do Sul State: MORG 38603, off Rio Grande, (30-45 m), 1983, NOAS coll. [1]; -Uruguay: MORG 20068, off La Paloma (40 m), ii/1978, L.Alvarez coll. [1].

Distribution
Southeast and south coasts of Brazil (Espírito Santo, Rio de Janeiro and Rio Grande do Sul States); coast of Uruguay.

Etymology
The species is named after the city of Aracruz, type locality.

Remarks
Turbonilla aracruzensis (figs 61-65) shares with *T. krebsii* (figs 49-54), *T. pupoides* (figs 55-60), and *T. midas* n. sp. (see next species description) the same light brown, lustrous shell surface, but is distinguished by its shape, with a somewhat acuminate apex (fig. 61) and semi-pyriform whorls profile (figs 61-63).

Turbonilla midas n. sp. (figs 66-71)

Description
Shell tall, slender and conical; color light brown. Teleoconch whorls strictly straight in profile. Suture shallow, straight. Protoconch heterostrophic planispiral; diameter about 300 µm. Axial ribs low, straight, orthocline or slightly opisthocline; evanescent on anterior whorls; 26 on body whorl of holotype; interspaces about as wide as the ribs, with microscopic axial striae. Spiral sculpture formed by about 17 thin striae that cross the ribs on anterior whorls. Base elongate with evanescent axial ribs and very thin spiral striae. Aperture pyriform. Columella obliquely straight, with obsolete fold. Outer lip thin. No umbilical fissure.

Dimensions.
Holotype with 12 teleoconch whorls; height 8.5 mm; width 1.5 mm.

Type material. Holotype: MORG 41042 off Santos, São Paulo State (45 m), 24/ix/1969, NOAS coll.; Paratypes: MNRJ 8925; MNHN type locality; ANSP 410345; MORG 41043, off Rio Grande, Rio Grande do Sul State, (30-45 m), 1983, AS coll.; IBUFRJ 11905, Prainha, Arraial do Cabo, Rio de Janeiro State, 1989, T.Almeida coll.

Type locality
Off Santos (45 m), São Paulo State, southeast coast of Brazil.

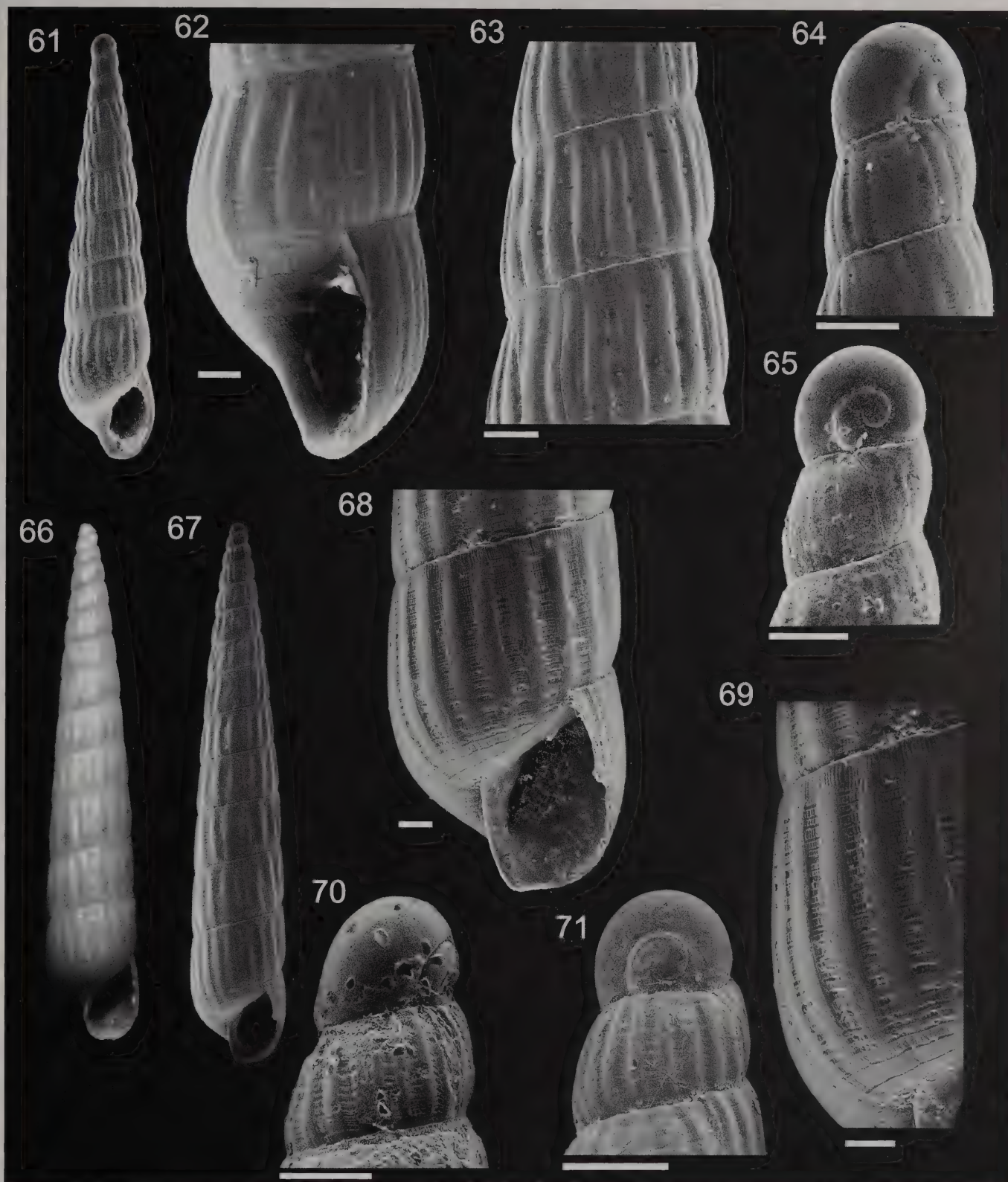
Additional material
-- São Paulo State: MORG 15100, off Santos (45 m), 24/ix/1969, NOAS coll. [1]; --Rio de Janeiro State: IBUFRJ 6783 off Prainha, Arraial do Cabo, 1989, T. Almeida coll. [2]; IBUFRJ 9424 Arquipélago de Santana, Macaé, v/1993, NOAG coll. [1]; -- Rio Grande do Sul state: MORG 38570 off Rio Grande, # 4 (50 m), x/1983, NOAS coll. [1].

Distribution
Southeast and south coasts of Brazil (Rio de Janeiro, São Paulo and Rio Grande do Sul States).

Etymology
The species is named after Midas, king of Frígia, whose touch, according to the legend, changed anything into gold. An allusion to the somewhat golden shell surface.

Remarks
Turbonilla midas (figs 66-71) has the same shell surface color as *T. aracruzensis* (figs 61-65) but with the addition of a light golden tone. It can also be distinguished by its shell shape, with a strictly straight whorls profile (figs 66-68); in *T. aracruzensis* the whorls profile is slightly convex. The spiral sculpturing (figs 68, 69) is stronger and numerous in *T. midas*.

Turbonilla portoricana Dall & Simpson, 1901 (figs 72-78)

Turbonilla portoricana Dall & Simpson, 1911: 414-415, pl. 53,

Figs 61-65. *Turbonilla aracruzensis* n. sp. 61-64: holotype (MNRJ 8928); 65: paratype (IBUFRJ 11904). Fig. 61: whole shell (length 5.4 mm); fig. 62: last whorl; fig. 63: detail of sculpture on last whorl; figs 64, 65: protoconch. Scale bars: 200 µm.

Figs 66-71. *Turbonilla midas* n. sp. 66, 71: paratype (MNHN); 65, 67-70: holotype (MORG 41042). Figs 66, 67: whole shell (lengths: 66: 8.2 mm, 67: 8.5 mm); fig. 68: last whorl; fig. 69: detail of sculpture on last whorl; figs 70, 71: protoconch. Scale bars: 200 µm.

Figg. 61-65. *Turbonilla aracruzensis* n. sp. 61-64: olotipo (MNRJ 8928); 65: paratipo (IBUFRJ 11904). Fig. 61: conchiglia intera (lunghezza 5,4 mm); fig. 62: ultimo giro; fig. 63: dettaglio della scultura dell'ultimo giro; figg. 64, 65: protoconca. Scala di riferimento: 200 µm.

Figg. 66-71. *Turbonilla midas* n. sp. 66, 71: paratipo (MNHN); 65, 67-70: olotipo (MORG 41042). Figg. 66, 67: conchiglia intera (lunghezza: 66: 8,2 mm, 67: 8,5 mm); fig. 68: ultimo giro; fig. 69: dettaglio della scultura dell'ultimo giro; figure 70, 71: protoconca. Scala di riferimento: 200 µm.

fig. 15; WARMKE & ABBOTT (1962: 149, pl 29, fig. i); JONG & COOMANS (1988: 128); DIAZ & PUYANA (1994: 238, fig. 952); ODÉ (1996: 52-53).

Type locality
Mayaguez, Porto Rico.

Types
Holotype: USNM 160204.

Material examined
The type and: --Espírito Santo State: IBUFRJ 8840, off Camburi, # 6 (60 m), 30/ix/1986, Eq.Zoo coll. [8]; IBUFRJ 8841, off Camburi (45 m), 15/i/1987, Eq.Zoo.coll. [1]; IBUFRJ 8842, off Camburi (60 m), 18/xi/19/86, Eq.Zoo.coll. [11]; IBUFRJ 8843, off Camburi (60 m), 25/xi/1987, Eq.Zoo.coll. [1]; IBUFRJ 8844, off Camburi (60 m), 12/ii/1987, Eq.Zoo.coll. [1]; --Rio de Janeiro State: IBUFRJ 9728, Arquipélago de Santana, Macaé, v/1993, NOAG coll. [35]; IBUFRJ 8836, off Cabo Frio, CFVII # 6147 (22°53.7'S, 041°50.5'W, 50 m), 24/iii/1983, NOAS coll. [22]; IBUFRJ 7197, CFVII # 6174 (23°16.8'S, 043°02.7'W, 92 m), 29/iii/1983, NOAS coll. [1]; IBUFRJ 7204, CFVII # 6197 (23°54.2'S, 044°12.4'W, 103 m), 02/iv/1983, NOAS coll. [5]; IBUFRJ 8837, CFVII # 6178 (23°39.7'S, 043°14.2'W, 119 m), 30/iii/1983, NOAS coll. [14]; IBUFRJ 8838, CFVII # 6172 (23°42.2'S, 043°01.1'W, 129 m), 28/03/1983, NOAS coll. [5]; IBUFRJ 8839, off Cabo Frio, CFVII # 6165 (23°02.8'S, 042°46'W, 56 m), 23/iii/1983, NOAS coll. [23]; MORG 11259, off Rio de Janeiro State, vi/1966, S. Paes coll. [2]; MORG 16557, off Rio de Janeiro State (100 m), xi/1969, 100 m, NOAS coll. [1]; MORG 19860, Praia dos Anjos, Cabo Frio, vi/1972, NOAS coll. [1]; MORG 27096, off Cabo Frio (55 m), xi/1988, NOAS coll. [1]; MZSP19451, off Cabo Frio (23°S, 042°10'W, 64 m), 10/iii/1971, NOWB coll. [4]; --Rio Grande do Sul State: MORG 23011, off Rio Grande # 13 (23 m), x/1983, AS coll. [1]; MORG 23064, off Rio Grande # 30, 26 m, x/1983, AS coll. [2]; MORG 23091, off Rio Grande # 38 (38 m), x/1983, AS coll. [10].

Distribution
Mayaguez, Porto Rico; West Indies; Colombian Caribbean; southeast and south coasts of Brazil (Espírito Santo, Rio de Janeiro and Rio Grande do Sul States).

Remarks
Although described from the Caribbean region, where it was recorded from several localities (JONG & COOMANS, 1988; DIAZ & PUYANA, 1994), along the Brazilian coast, *T. portoricana* is restricted to localities below 19° S (Espírito Santo State). In spite of this apparently disjunct distribution, the Brazilian specimens (figs 74-78) doubtless belong to this species (holotype in figs 72, 73). The similarities in the shell shape, with a conical outline and straight whorl profiles (figs 72, 74), and in the sculpturing (figs 73, 75, 76) are remarkable. Also, the rhomboid aperture with a well-developed columellar fold and reflected inner lip (fig. 75) is exactly the same as in the holotype (figs 73). Indeed, the spiral sculpture formed by six or seven deep rectangular furrows (fig. 76) is very constant in the several Brazilian exemplars studied.

Turbonilla maestratii n. sp. (figs 79-84)

Description
Shell moderately tall, slender, slightly conical to subcilindrical; fresh shells transparent, older ones white. Teleoconch whorls almost flat-sided in profile. Suture shallow, somewhat sinuous by ribs projection. Protoconch heterostrophic planispiral; diameter about 290 μm. Axial ribs slender, straight and orthocline; slightly projected over anterior suture; ending abruptly at periphery of last whorl; 19 on body whorl of holotype; interspaces as wide as the ribs. Spiral sculpture formed by about 17 rows of rectangular, deep furrows of regular width and spacing. Base rounded tending to elongate, with 4-5 thin spiral striae. Aperture slightly pyriform tending to rhomboid. Columella somewhat arcuate, with obsolete fold. Outer lip thin. No umbilical fissure.

Dimensions.
Holotype with 11 teleoconch whorls; height 5.3 mm; width 0.9 mm.

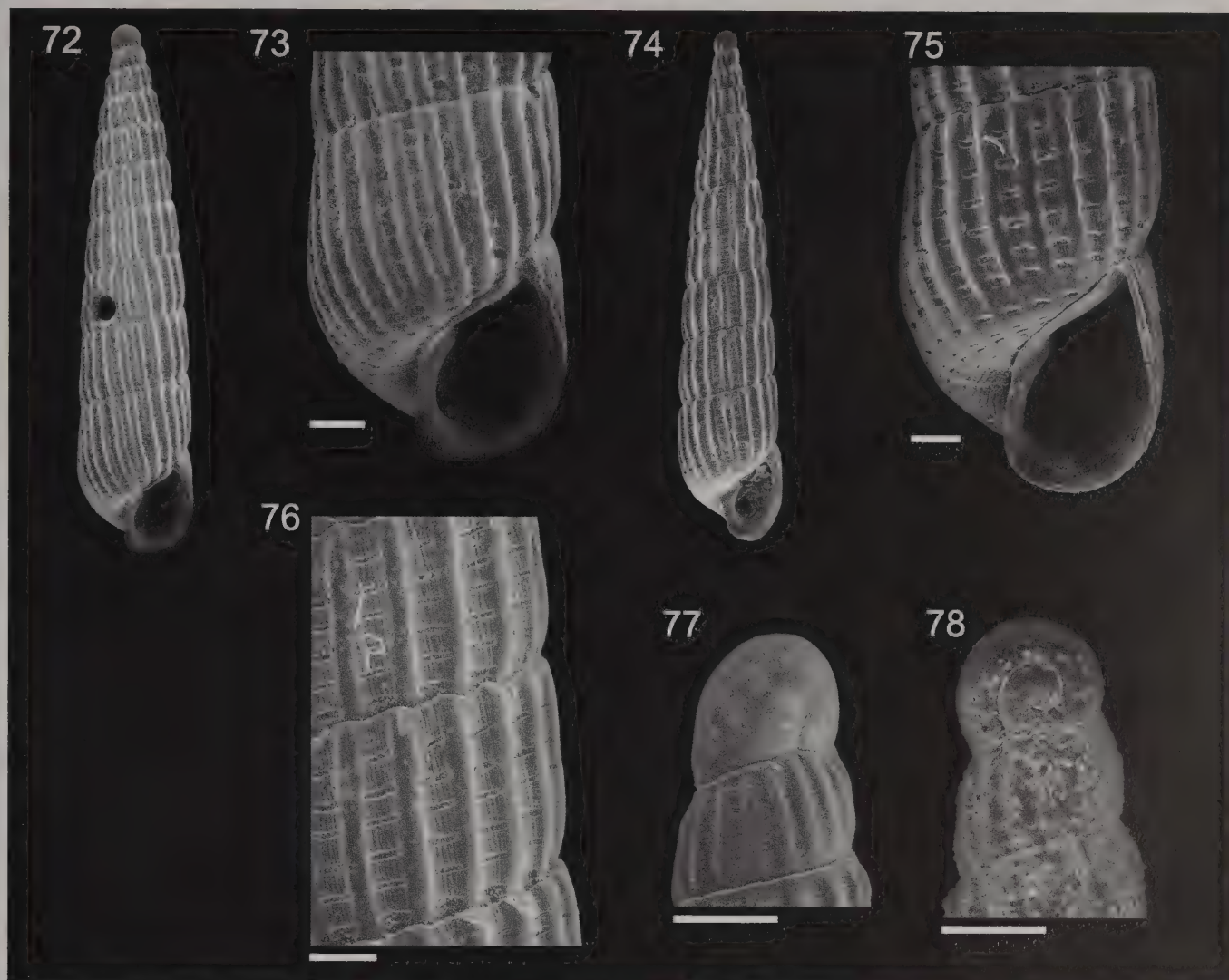
Type material
Holotype: MNRJ 8934 Praia do Despacho, Itaparica, Bahia State, 1984-99, P. Maestrati coll.; Paratypes: ANSP 410347; MNHN; ZMA 4.02.023; MORG 41044; MNRJ 8927; MZSP 35852; MNRJ 8933; IBUFRJ 11906, type locality.

Type locality
Praia do Despacho, Itaparica, Bahia State, northeast coast of Brazil.

Additional material
--Pará State: IBUFRJ 8905, off Pará, AMASSEDS # 4134, RVCI coll. [2]; --Pernambuco State: MMUFRPE, off Itaparica [8]; --Bahia State: MNHN, Praia do Despacho, Itaparica, 1984-99, P.Maestrati coll. [27]; IBUFRJ 9781, Bom Despacho, Itaparica, L.Trinchão coll. [2]; -- Espírito Santo State: IBUFRJ 9427, Camburi # 2 (45 m), 04/ix/1986, Eq.Zoo coll. [1]; --Rio de Janeiro State: IBUFRJ 9467, off Cabo Frio, CFVII # 6147 (22°53.7'S, 041°50.5'W, 50 m), 24/iii/1983, NOAS coll. [2]; IBUFRJ 10297, off Prainha, Arraial do Cabo, 1990, T.Almeida coll. [1].

Distribution
North, northeast and southeast coasts of Brazil (Pará, Bahia, Espírito Santo and Rio de Janeiro States).

Etymology
The species is named after Dr. Phillippi Maestrati (MNHN), who collected mollusks along the northeast coast of Brazil, including the material of this new species.

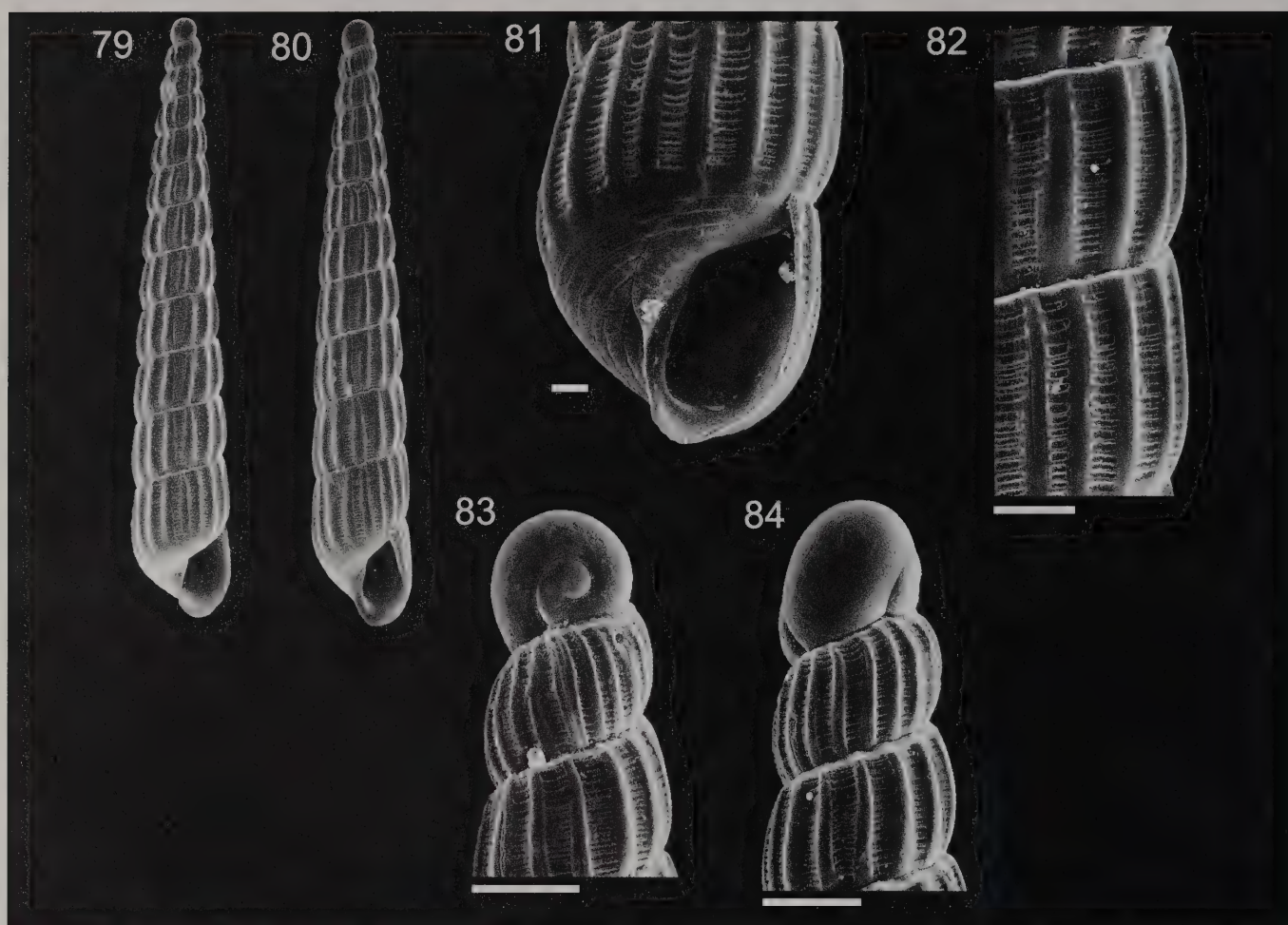
Remarks
Turbonilla maestratii (figs 79-84) shows some resemblance to *T.*

Figs 72-78. *Turbonilla portoricana* Dall & Simpson, 1901. 72, 73: holotype (USNM 160204); 74, 76, 78: (IBUFRJ 8837); 75: (IBUFRJ 8839); 77: (IBUFRJ 8836). Figs 72, 74: whole shells (lengths: 72: 4.4 mm; 74: 5.5 mm); figs 73, 75: last wholrs; fig. 76: detail of sculpture; figs 77, 78: protoconch. Scale bars: 200 µm.
Figg. 72-78. *Turbonilla portoricana* Dall & Simpson, 1901. 72, 73: olotipo (USNM 160204); 74, 76, 78: (IBUFRJ 8837); 75: (IBUFRJ 8839); 77: (IBUFRJ 8836). Figg. 72, 74: conchiglie intere (lunghezze: 72: 4,4 mm; 74: 5,5 mm); figg. 73, 75: ultimo giro; fig. 76: dettaglio della scultura; figg. 77, 78: protoconca. Scala di riferimento: 200 µm.

portoricana (figs 72-78), especially in the conical shell shape, straight whorl profile, and axial ribs. It can be distinguished, however, by the spiral striae (figs 81, 82), much more numerous and narrow in *T. maestratii*, and by the aperture (fig. 81), which does not show the columellar fold. In addition, the axial ribs do not extend over the base (fig. 81), as they do in *T. portoricana* (figs 73, 75).

Turbonilla insularis Dall & Simpson, 1901 and *Turbonilla santodomingensis* Gabb, 1873 (figure in Pilsbry, 1922) are similar in their slender conical shell shape, but in both species the spiral sculpturing is composed of fewer striations than in *T. maestratii* (7 in *T. santodomingensis* and 11 in *T. insularis*, while there are about 15 in *T. maestratii*) (figs 81, 82). Moreover, *T. insularis* has more axial ribs on the last whorl (28), which invade the base; in *T. maestratii*, there are fewer axial ribs (19 on the last whorl of the holotype), which end abruptly before entering the base (fig. 81).

Turbonilla kaapor n. sp. (figs 85-89)

Description

Shell moderately tall, slender, slightly conical to subcilindrical; color white. Teleoconch whorls slightly convex in profile. Suture somewhat deep and sinuous by ribs projection. Protoconch heterostrophic planispiral elevated; diameter about 240 µm. Axial ribs well marked, broad, straight and slightly prosocline; projected over anterior suture; fairly distinct on first teleoconch whorl; ending abruptly at periphery of last whorl; 25 on body whorl of holotype; interspaces as wide as the ribs. Spiral sculpture formed by 6-7 rows of rectangular, deep furrows regularly spaced. Base rounded-elongate, with 4-5 thin spiral striae. Aperture pyriform tending to rhomboid. Columella somewhat arcuate, without fold. Outer lip thin. No umbilical fissure.

Figs 79-84. *Turbonilla maestratii* n. sp. 79, 81, 82: holotype (MNRJ 8934); 80: paratype (MNRJ 8927), 83: paratype (MNRJ 8927); 84: paratype (MNRJ 8927). Figs 79, 80: whole shells (lengths: 79: 5.3 mm, 80: 4.4 mm); fig. 81: last whorl; fig. 82:detail of sculpture; figs 83, 84: protoconchs. Scale bars: 200 μm.
Figg. 79-84. *Turbonilla maestratii* n. sp. 79, 81, 82: olotipo (MNRJ 8934); 80: paratipo (MNRJ 8927), 83: paratipo (MNRJ 8927); 84: paratipo (MNRJ 8927). Figg. 79, 80: conchiglie intere (lunghezze: 79: 5,3 mm, 80: 4,4 mm); fig. 81: ultimo giro; fig. 82: dettaglio della scultura; figg. 83, 84: protoconche. Scala di riferimento: 200 μm.

Dimensions
Holotype with 7.25 teleoconch whorls; height 4.1 mm; width 0.9 mm.

Type material
Holotype: MZSP 35853, off São Paulo State, PADCT # 6631 (25°46'S, 045°28.8'W, 164 m), NOWB coll. Paratypes: MNRJ 8932; IBUFRJ 11907; ANSP 410348; MNHN, type locality; MZSP 35854, off Santa Catarina State, PADCT # 6611 (28°24.3'S, 047°21.6'W, 195 m).

Type locality
Off São Paulo State, PADCT # 6631 (25°46'S, 045°28.8'W, 164 m), southeast coast of Brazil.

Distribution
Southeast-south costs of Brazil (São Paulo and Santa Catarina States).

Etymology
This species is named after the Brazilian Indian tribe Kaapor.

Remarks
Turbonilla kaapor (figs 85-89) is somewhat similar to *T. portoricana* (figs 72-78) in the axial and spiral sculpture, but the axial ribs are faint in the first teleoconch whorl (figs 85, 88, 89), the shell is pupoid in outline (fig. 85), and the protoconch is elevated (figs 88, 89), with its whorl somewhat detached from the teleoconch (fig. 89). This kind of protoconch is also present in *Turbonilla stimpsoni* Bush, 1899 (figs 92, 93), which is also similar in having faint ribs on the first teleoconch whorl; but the shell of the latter is taller, with a more acuminate apex (figs 90, 91) and the spiral sculpture is more complex, with more numerous and irregular striae (fig. 94) than *T. kaapor*, which has about seven rectangular pits per interspace (figs 86, 87).

Turbonilla stimpsoni **Bush, 1899 (Figs 90-94)**

Turbonilla stimpsoni Bush, 1899: 156, pl. 8, fig. 7; Jong & Coomans (1988: 130, pls. 20, 26, fig. 677); Johnson (1989: 65); Odé (1996: 57); Absalão & Pimenta (1999: 82-83, figs. 16, 16a).

Type locality
Coasts of North and South Carolina.

Types
Holotype by monotypy: ANSP 72042.

Material examined
The type and: --Amapá State: IBUFRJ 8861, AMASSEDS # 3210 (01°52.45'N, 016.02'W, 47 m), 12/v/1990, RVCI coll. [18]; IBUFRJ 8939, AMASSEDS # 3209 (01°20.9'N, 048°00.2'W, 53 m), 12/v/1990, RVCI coll. [5].

Distribution.
Coasts of North and South Carolina; north coast of Brazil (Amapá State).

Remarks
For description, see BUSH (1899) and ABSALÃO & PIMENTA (1999). This species is compared with *T. kaapor* (figs 85-89) in the section dealing with the latter.

Turbonilla cf. *riisei* (Mörch, 1875) (figs 95-100)

Chemnitzia riisei Mörch, 1875: 165.
Turbonilla riisei: JONG & COOMANS (1988: 129, pl. 7fig. 673); ODÉ (1996: 56); ABSALÃO & PIMENTA (1999: 81-82, fig. 20); REDFERN (2001: 150, pl. 67, figs 623A, 623B).
Turbonilla pilsbryi Bush, 1899: 151, pl. viii, fig. 9; JOHNSON (1989: 58).

Type locality.
Saint Thomas, West Indies.

Types
Types not located. Holotype of *T. pilsbryi* by monotypy: ANSP 72045.

Material examined
The type and: --Amapá State: MORG 38581, off Amapá State (56 m), 01/v/1968, NOAS coll. [1]; --Pará State: IBUFRJ 8979, off Pará State, RVCI coll. [2]; --Bahia State: IBUFRJ 9459, off Guarajuba, Itapuã, 1990, L.Trinchão coll. [1]; --Espírito Santo State: IBUFRJ 8975, off Espírito Santo State [7]; IBUFRJ 8976, off Aracruz, 01/viii/1988, V.Abud coll. [8]; IBUFRJ 9790, off Camburi, 19/iii/1993, Eq.Zoo. coll. [4]; --Rio de Janeiro State: IBUFRJ 8978, off Prainha, Arraial do Cabo, T.Almeida coll. [1]; MZSP 30906, off Bacia de Campos # 01 (21°21'05"S, 040°47'25"W, 20 m) [2].

Distribution
Bermuda; West Indies; north, northeast and southeast coasts of Brazil (Amapá, Pará, Bahia, Espírito Santo and Rio de Janeiro States).

Remarks
For descriptions and discussions, see BUSH (1899), JONG & COOMANS (1988), and ABSALÃO & PIMENTA (1999). JONG & COOMANS (1988) pointed out that *T. pilsbryi* Bush, 1899 is a junior synonym of *T. riisei*, a position followed by ODÉ (1996). This was based on the fact that the holotype of *T. pilsbryi* (photograph in ABSALÃO & PIMENTA, 1999: fig. 20) encompasses the variation found by JONG & COOMANS (1988) in *T. riisei*.
The shell of *Turbonilla riisei* from the West Indies illustrated by JONG & COOMANS (1988), and also the holotype of *T. pilsbryi*, are more inflated and wider than the Brazilian specimens. In fact, the Brazilian material shows wide variation in shell form (figs 95-97), with some specimens (fig. 95) almost as wide as the material from the Caribbean, but others (fig. 97) more slender. Since the spiral and axial sculptures are in the same pattern in the Brazilian specimens (fig. 98) and in the holotype, and we could not correlate the variation in shell form of the Brazilian specimens with any geographical distribution, we regard all of them as belonging to the taxon *T.* cf. *riisei*.

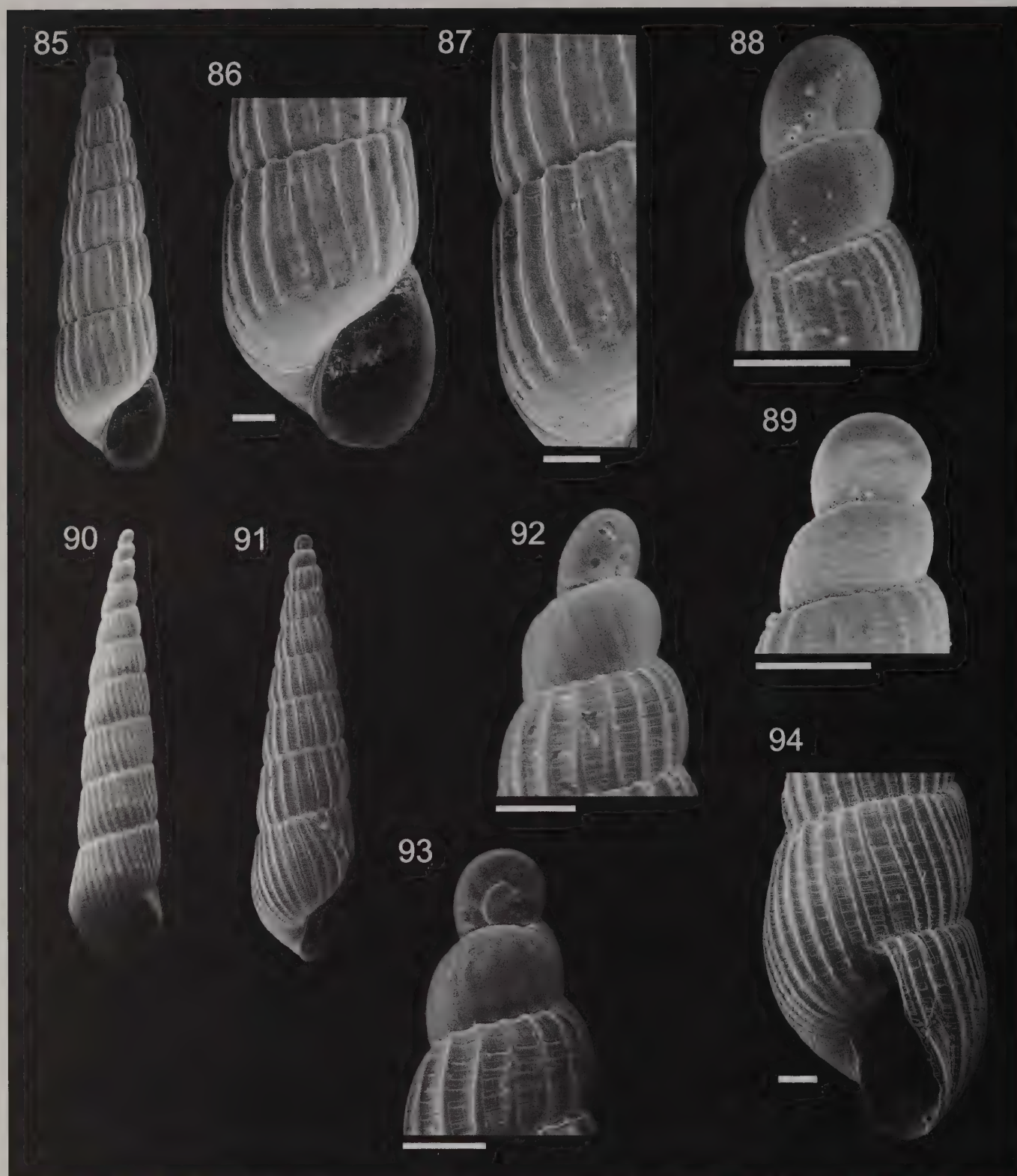
Turbonilla capixaba n. sp. (figs 101-106)

Description
Shell small, slightly conical to slightly subcilindrical; color white with yellow spiral band on middle of each whorl. Teleoconch whorls straight to slightly convex in profile. Suture somewhat deep, slightly sinuous by ribs projection. Protoconch heterostrophic planispiral; diameter about 290 µm. Axial ribs slender, straight or slightly sinuous, orthocline or slightly opisthocline; 21 on body whorl of holotype; interspaces about twice the width of the ribs, sculptured by microscopic axial striae. Spiral sculpture formed by about 16 rows of furrows of irregular width and spacing along interspaces. Base rounded, with evanescent ribs and very thin spiral furrows. Aperture pyriform tending to rhomboid. Columella obliquely straight, with very obsolete fold. Outer lip thin. No umbilical fissure.

Dimensions
Holotype with 7 teleoconch whorls; height 3.8 mm; width 1.1 mm.

Type material
Holotype: MNRJ 8926, off Espírito Santo State, REVIZEE # VV38 (19°28'S, 038°22'W, 71.4 m), 29/ii/1996, NOAN coll.; Paratypes: MNRJ 8937; MORG 41045; MZSP 35857; IBUFRJ 11908; ZMA 4.02.024; ANSP 410349; MNRJ 8938; MNHN, type locality.

Type locality
Off Espírito Santo State, REVIZEE # VV38 (19°28'S, 038°22'W, 71.4 m), southeast coast of Brazil.

Additional material
-- Espírito Santo State: MORG 39059, REVIZEE # VV38 (19°28'S, 038°22'W, 71.4 m), 29/ii/1996, NOAN coll. [5]; IBUFRJ 9660, REVIZEE # VV38 (19°28'S, 038°22'W, 71.4 m), 29/ii/1996, NOAN coll. [37]; IBUFRJ 9409, REVIZEE # VV24 (20°S, 039°54'W, 45 m), 27/ii/1996, NOAN coll. [5]; --Rio de Janeiro State: IBUFRJ 9768, off Bacia de Campos

Figs 85-89. *Turbonilla kaapor* n. sp. 85-88: holotype (MZSP 35853); 89: paratype (MNRJ 8932). Fig. 85: whole shell (length 4.1 mm); fig. 86: last whorl; fig. 87: detail of sculpture on last whorl; figs 88, 89: protoconchs. Scale bars: 200 µm.

Figs 90-94. *Turbonilla stimpsoni* Bush, 1899. 90: holotype (ANSP 72042); 91-94: (IBUFRJ 8861). Figs 90, 91: whole shells (lengths: 90: 4.8 mm, 91: 4.7 mm); figs 92, 93: protoconchs; fig. 94: last whorl. Scale bars: 200 µm.

Figg. 85-89. *Turbonilla kaapor* n. sp. 85-88: olotipo (MZSP 35853); 89: paratipo (MNRJ 8932). Fig. 85: conchiglia intera (lunghezza 4,1 mm); fig. 86: ultimo giro; fig. 87: dettaglio della scultura dell' ultimo giro; figure 88, 89: protoconche. Scala di riferimento: 200 µm.

Figg. 90-94. *Turbonilla stimpsoni* Bush, 1899. 90: olotipo (ANSP 72042); 91-94: (IBUFRJ 8861). Figg. 90, 91: conchiglie intere (lunghezze: 90: 4,8 mm, 91: 4,7 mm); figg. 92, 93: protoconche; fig. 94: ultimo giro. Scala di riferimento: 200 µm.

Figs 95-100. *Turbonilla* cf. *riisei* (Mörch, 1875). 95: (IBUFRJ 8980); 96-100: (IBUFRJ 8975). Figs 95-97: whole shells (lengths: 95: 2.6 mm, 96: 2.9 mm, 97: 3.9 mm); fig. 98: last whorl; figs 99, 100: protoconchs. Scale bars: 300 µm.
Figg. 95-100. *Turbonilla* cf. *riisei* (Mörch, 1875). 95: (IBUFRJ 8980); 96-100: (IBUFRJ 8975). Figg. 95-97: conchiglie intere (lunghezze: 95: 2,6 mm, 96: 2,9 mm, 97: 3,9 mm); fig. 98: ultimo giro; figg. 99, 100: protoconche. Scala di riferimento: 300 µm.

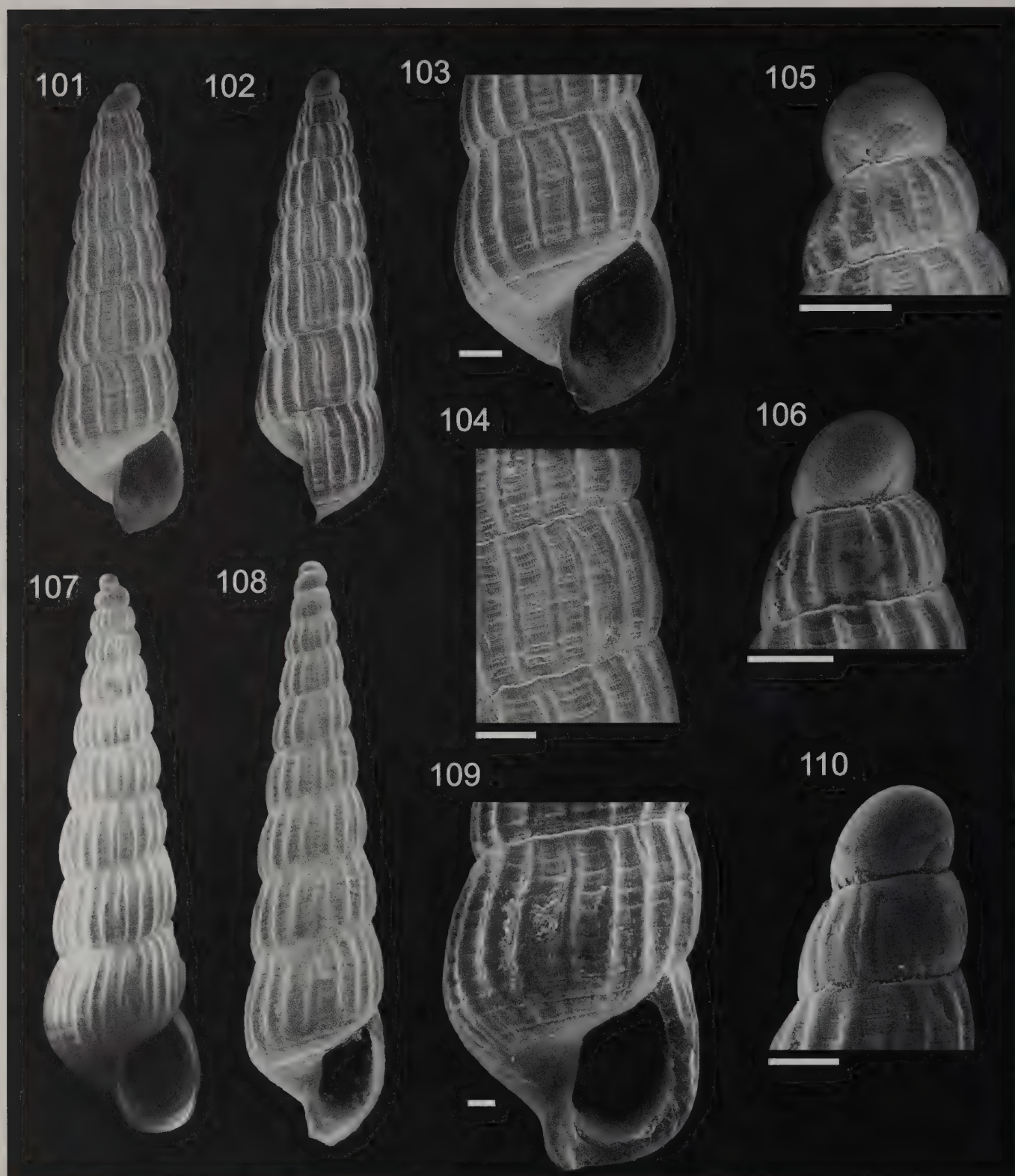
(22°47'47"S, 040°45'32"W), NOAG coll. [1]; IBUFRJ 9410, off Cabo Frio, CFVII # 6165 (23°02.8'S, 042°46'W, 56 m), 23/iii/1983, NOAS coll. [5].

Distribution
Southeast coast of Brazil (Espírito Santo and Rio de Janeiro States).

Etymology
"Capixaba" is the general determination to those people that was born in Espírito Santo State, Brazil.

Remarks
Turbonilla capixaba (figs 101-106) is somewhat similar in general shell shape to *Turbonilla interrupta* (Totten, 1835) and its many synonyms, such as *Turbonilla areolata* Verrill, 1873 and *Turbonilla buteonis* Bartsch, 1909, among others [complete lists of synonyms in Abbott (1974) and Odé (1996)]. However, there are differences in the more numerous spiral sculpture of *T. capixaba* (figs 103, 104), more marked axial ribs, and more convex whorl outline (figs 101-103).

Turbonilla capixaba shows some similarity in spiral sculpture with *Turbonilla rushii* Bush, 1899 [holotype illustrated by Pimenta & Absalão (2001: 79, fig. 17)] and *T. anira* Bartsch, 1927 (fig. 107), but the shell is not as tall as in these two species, and the whorls outline is straighter. The most similar species, however, are *Turbonilla lineolata* Bush, 1899 and *Turbonilla fasciata* (d'Orbigny, 1840). *Turbonilla lineolata* also has a yellow spiral band and similar shell shape, but the shell is larger, less slender, with more regularly convex whorls, the spiral lines are more regularly spaced, lacking the finer lines, and the axial ribs are straighter. *Turbonilla fasciata* [figures in Pimenta & Absalão (2001: 77, figs 12-16)] is also similar, especially in the spiral sculpture pattern, but *T. capixaba* has more sinuous axial ribs (figs 103, 104) and a more conical shell (figs 101, 102) than *T. fasciata*, which has scalloped whorls in a somewhat pupoid shell shape.

Turbonilla **cf.** ***anira*** **Bartsch**, 1927 (figs 107-110)
Turbonilla anira Bartsch, 1927: 84-85; Odé (1996: 35).

Figs 101-106. *Turbonilla capixaba* n. sp. 101-105: holotype (MNRJ 8926); 106: paratype (MNRJ 8937). Figs 101, 102: whole shell (length: 3.8 mm); fig. 103: last whorl; fig. 104: detail of sculpture; figs 105, 106: protoconchs. Scale bars: 200 µm.

Figs 107-110. *Turbonilla* cf. *anira* Bartsch, 1927: 107: holotype (USNM 108058); 108, 109: (IBUFRJ 9426); 110: (IBUFRJ 3151). Figs 107, 108: whole shells (lengths: 107:8.3 mm, 108: 7.8 mm); fig. 109: last whorl; figs 110: protoconch. Scale bars: 200 µm.

Figg. 101-106. *Turbonilla capixaba* n. sp. 101-105: olotipo (MNRJ 8926); 106: paratipo (MNRJ 8937). Figure 101, 102: conchiglia intera (lunghezza: 3,8 mm); fig. 103: ultimo giro; fig. 104: dettaglio della scultura; figg. 105, 106: protoconche. Scala di riferimento: 200 µm.

Figg. 107-110. *Turbonilla* cf. *anira* Bartsch, 1927: 107: olotipo (USNM 108058); 108, 109: (IBUFRJ 9426); 110: (IBUFRJ 3151). Figg. 107, 108: conchiglie intere (lunghezze: 107: 8,3 mm, 108: 7,8 mm); fig. 109: ultimo giro; fig. 110: protoconca. Scala di riferimento: 200 µm.

Type locality.
Off Fernandina, Florida (530 m).

Type material
Holotype: USNM 108058; 12 paratypes (?): USNM 360179.

Material examined
The holotype's photograph and: --Espírito Santo State: IBUFRJ 9415, off Espírito Santo State [5]; --Rio de Janeiro State: IBUFRJ 8720 off Bacia de Campos, NOAG coll. [1]; IBUFRJ 9417, CFVII # 6194 (24°03.6'S, 044°07.6'W, 134 m), 01/iv/1983, NOAS coll. [2]; IBUFRJ 3151, Prainha, Arraial do Cabo, 1989, T.Almeida coll. [2]; MZSP 28880, off Angra dos Reis, 18/ii/1968 [1]; IBUFRJ 9416, CFVII # 6178 (23°39.7'S, 043°14.2'W, 119 m), 30/iii/1983, NOAS coll. [4]; IBUFRJ 10313, REVIZEE # D3 (22°52'S, 041°09'W, 80 m), 23/ii/1996, NOAN coll. [2]; IBUFRJ 11071, off Bacia de Campos, NOAG coll. [1].

Distribution
Florida; southeast coast of Brazil (Espírito Santo and Rio de Janeiro States).

Remarks
The Brazilian specimens determined herein as *Turbonilla* cf. *anira* (figs 108-110) differ slightly from the type of *T. anira* (fig. 107). In the type there are more and more sinuous axial ribs, the first four whorls are wider (fig. 108), and the protoconch is smaller (fig. 107). In spite of these differences, the general shell shape and sculpture are very similar (figs 107, 108).
Turbonilla cf. *anira* most closely resembles *T. rushii* Bush, 1899 [holotype figured by Absalão & Pimenta (1999: fig. 17)], but the spiral sculpturing in *T. rushii* is more numerous and variable than in T. cf. anira (fig. 109).

Turbonilla scapulata n. sp. (figs 111-115)

Description
Shell moderately tall, conical with somewhat scaloned whorls; color white. Teleoconch whorls almost flat-sided, slightly concave on middle and shouldered at the summits. Suture somewhat deep and sinuous, with distinct subsutural shelf. Protoconch heterostrophic planispiral; diameter about 280 µm. Axial ribs slender, straight and orthocline; strongly shouldered apically, not reaching the anterior suture, leaving a spiral band that looks like a second suture; 23 on body whorl of holotype; interspaces much wider than the ribs, bearing microscopic axial growth lines. Spiral sculpture formed by about 20 rows of very thin and close furrows, with three wider furrows, below the shoulder of the whorls, on middle of whorl and just above the suture. Base rounded, with evanescent ribs and very thin spiral striae. Aperture rhomboid. Columella straight, without fold. Outer lip thin. No umbilical fissure.

Dimensions
Holotype with 8 teleoconch whorls; height 4.6 mm; width 1.3 mm.

Type material
Holotype: MZSP 35858, off São Paulo State, PADCT # 6579 (24°42.3'S, 045°18.8'W, 84 m), NOWB coll.; Paratypes: IBUFRJ 11909; ANSP 410350; MNHN; MNRJ 8920; MZSP 35862, type locality.

Type locality
Off São Paulo State, PADCT # 6579 (24°42.3'S, 045°18.8'W, 84 m), southeast coast of Brazil.

Distribution
Only known from type locality (off São Paulo State).

Etymology
This species is named after its shouldered whorls (*scapula*, L. = shoulder blade).

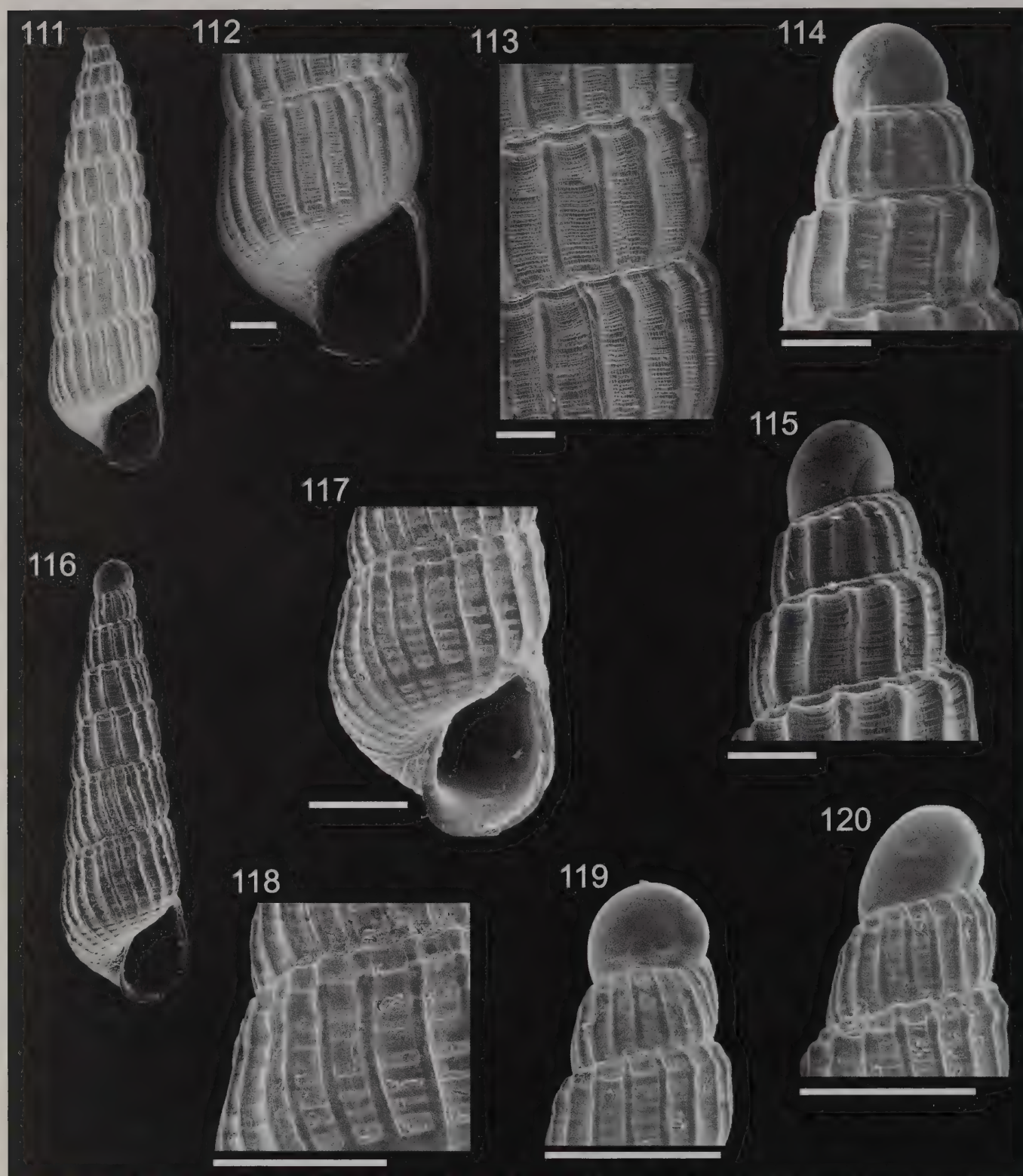
Remarks
Turbonilla scapulata (figs 111-115) shows some similarity to *Turbonilla asperula* Bush, 1899 [lectotype illustrated by Absalão & Pimenta (1999: figs. 17, 17a)] in the apically shouldered axial ribs (fig. 113) and whorls (figs 111, 112). However, it is clearly distinguished by its much more numerous and finer spiral sculpture (fig. 113).

Turbonilla paulinoi n. sp. (figs. 116-120)

Description
Shell small, conical; color white. Teleoconch whorls semi-pyriform in profile. Suture somewhat deep and sinuous by ribs projection. Protoconch heterostrophic planispiral; diameter about 270 µm. Axial ribs slender, slightly sinuous and strictly prosocline; strongly shouldered apically and projected over anterior suture; 24 on body whorl of holotype; interspaces a little bit wider than ribs. Spiral sculpture formed by seven rows of rectangular, deep furrows regularly spaced intercaling with spiral cords that cross the axial ribs; the second cord, below the suture is wider and form small nodules when crossing the ribs. Base rounded, with ribs that continue through the parietal region and rows of spiral furrows. Aperture pyriform. Columella somewhat arcuate, without fold. Outer lip thin. No umbilical fissure.

Dimensions
Holotype with 6.5 teleoconch whorls; height 2.9 mm; width 0.8 mm.

Type material
Holotype: MNRJ 8941, off Pará State, AMASSEDS # 3209 (01°20.9'N, 48°00.2'W, 53 m), 12/v/1990, RVCI coll.; Paratypes: ANSP 410351; MNHN; MORG 41046; ZMA 4.02.025; MZSP 35860, type locality; IBUFRJ 11910, off Amapá State, AMASSEDS # 3228 (03°25.1'N, 49°56.4'W, 64 m), 17/v/1990, RVCI coll.

Type locality
Off Pará state (01° 20.9' N / 48° 00.2' W, 53 m), north coast of

Figs 111-115. *Turbonilla scapulata* n. sp. 111-114: holotype (MZSP 35858); 115: paratype (MNRJ 8920). Fig. 111: whole shell (length 4.6 mm); fig. 112: last whorl; fig. 113: detail of sculpture; figs 114, 115: protoconch. Scale bars: 200 µm.

Figs 116-120. *Turbonilla paulinoi* n. sp. 116-119: holotype (MNRJ 8941); 120: paratype (MORG 41046). Fig. 116: whole shell (length 2.9 mm); fig. 117: last whorl; fig. 118: detail of sculpture; figs 119, 120: protoconchs. Scale bars: 400 µm.

Figg. 111-115. *Turbonilla scapulata* n. sp. 111-114: olotipo (MZSP 35858); 115: paratipo (MNRJ 8920). Fig. 111: conchiglia intera (lunghezza 4,6 mm); fig. 112: ultimo giro; fig. 113: dettaglio della scultura; figg. 114, 115: protoconca. Scala di riferimento: 200 µm.

Figg. 116-120. *Turbonilla paulinoi* n. sp. 116-119: olotipo (MNRJ 8941); 120: paratipo (MORG 41046). Fig. 116: conchiglia intera (lunghezza 2,9 mm); fig. 117: ultimo giro; fig. 118: dettaglio della scultura; figg. 119, 120: protoconca. Scala di riferimento: 400 µm.

Brazil.

Additional material

--Pará State: IBUFRJ 8945, AMASSEDS # 3209 (01°20.9'N, 48°00.2'W, 53 m), 12/v/1990, RVCI coll. [2].

Distribution

Only known from two localities off Pará and Amapá states, north coast of Brazil.

Etymology

The species is named after Dr. Paulino J. S. de Souza Junior, Brazilian malacologist who collected the type material.

Remarks

The most similar species to *Turbonilla paulinoi* (figs 116-120) is *Turbonilla macaensis* Pimenta & Absalão, 2001. Both species bear a spiral cord of nodules below the sutures. However, in *T. macaensis*, the spiral cords form nodules on all the axial ribs that they cross, the strongest being the anterior one, which touches the suture above it; while in *T. paulinoi*, there are two spiral nodulose cords, the stronger being separated from the suture by a weaker cord of nodules (figs 117, 118).

Turbonilla rachialis n. sp. (figs 121-126)

Description

Shell stout, large, moderately conical; color light beige with white spiral band on middle of whorl. Teleoconch whorls broad, inflate and slightly convex in profile. Suture somewhat deep and sinuous by ribs projection. Protoconch heterostrophic planispiral; diameter about 320 µm. Axial ribs slender, somewhat sharp, straight and strictly orthocline; projected over anterior suture; 18 on penultimate whorl of holotype; interspaces very broad, about three times as wide as the ribs; entire surface of interspaces and tops of the ribs covered by axial micro striae. Spiral sculpture formed by numerous crowded micro striae that cover the interspaces and axial ribs and cross the axial striae forming a delicate reticulate pattern. Base elongate, with evanescent ribs and same spiral pattern as teleoconch whorls. Aperture pyriform. Columella somewhat arcuate, without fold. Outer lip thin. No umbilical fissure.

Dimensions

Holotype with 9 teleoconch whorls; height 10.4 mm; width 3.0 mm.

Type material

Holotype: MNRJ 8918, Prainha, Arraial do Cabo, Rio de Janeiro State, x/1998, P. de Sousa coll.; Paratypes: ANSP 410352, Prainha, Arraial do Cabo, Rio de Janeiro State, 26/ix/1998, P.M. Costa coll.; IBUFRJ 11915, off Piúma (21°10'S, 040°37'W, 16-18 m), Espírito Santo State, 1993, F. Pitombo coll.

Type locality

Prainha, Arraial do Cabo, Rio de Janeiro State, southeast coast of Brazil.

Distribution

Only known from two localities in Rio de Janeiro and Espírito Santo States.

Etymology

The species is named after its type locality, "Prainha" (small beach). Rachialis, belonging to the beach; rachia, L. = beach.

Remarks

Turbonilla rachialis (figs 121-126) is one of the largest *Turbonilla* in Brazil, with a very inflated shell (fig. 121, 122) and very low, sharp axial ribs with wide interspaces (figs 122, 123). It is also unique in its sculpture pattern, with very fine and crowded spiral sculpture crossing the microscopic axial striae, both crossing the axial ribs (figs 123, 124). These characteristics distinguish *T. rachialis* from any other Brazilian species.

Turbonilla uaca n. sp. (figs 127-132)

Description

Shell stout, large, tall, conical, with acuminate apex, last whorls inflated; color light brown. Teleoconch whorls straight in profile. Suture deep, sinuous by ribs projection. Protoconch heterostrophic planispiral; diameter about 300 µm. Axial ribs strictly straight and slightly prosocline; projected over anterior suture; 28 on body whorl of holotype; interspaces as wide as the ribs. Spiral sculpture formed by seven rows of deep furrows irregular both in width and spacing. Base rounded, with evanescent ribs and rows of spiral striae. Aperture pyriform tending to rhomboid. Columella somewhat arcuate, with distinct fold. Outer lip thin. Parietal callus well developed. Umbilical present.

Dimensions

Holotype with 11 teleoconch whorls; height 7.2 mm; width 1.7 mm.

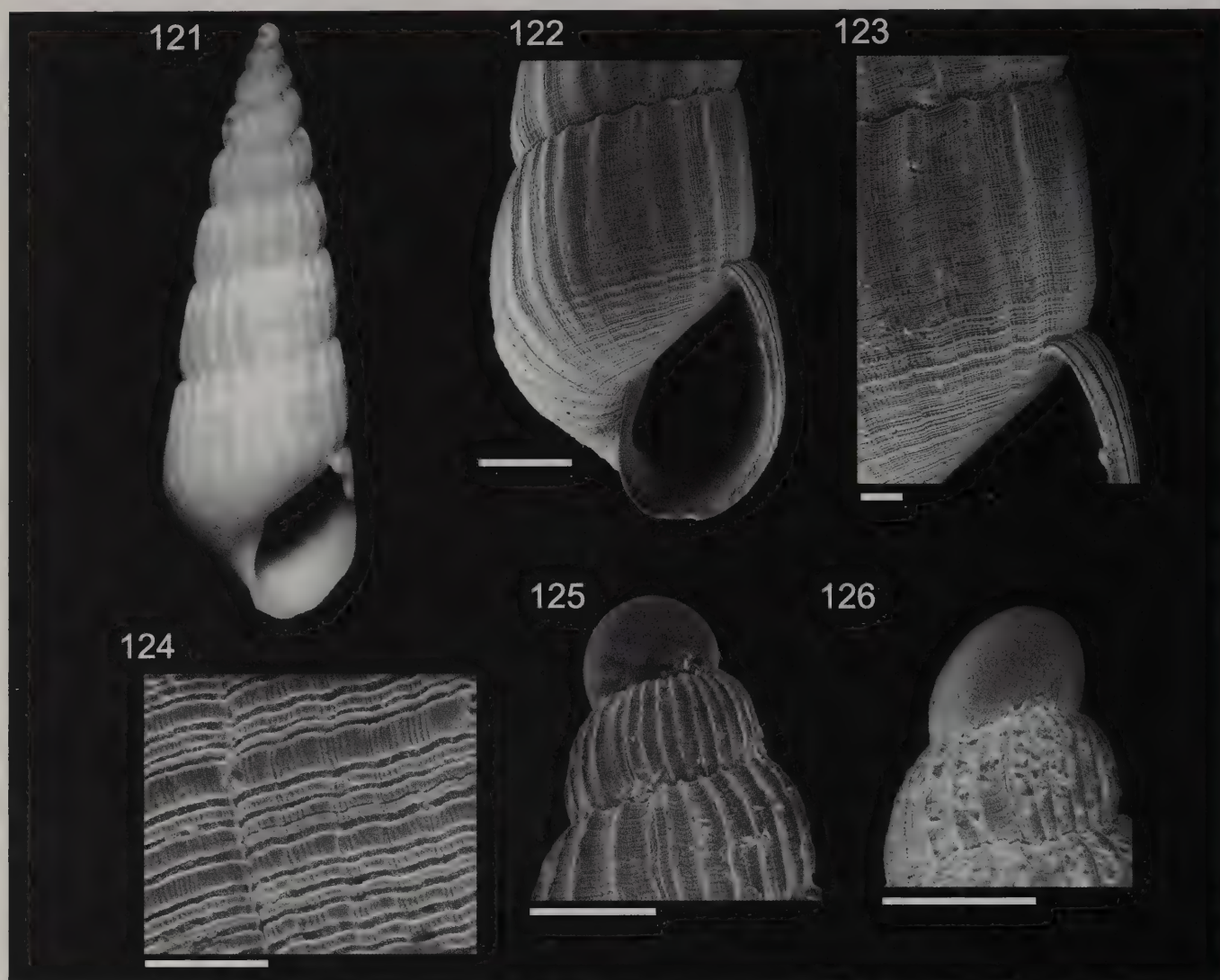
Type material

Holotype: MORG 41047, off Amapá State (56 m), 01/v/1968, NOAS coll.; Paratypes: MNRJ 8942; IBUFRJ 11911; MZSP 35863; ANSP 410353; MNHN; MORG 41052, type locality; MORG 41048, off Cabo Orange, Amapá State (85 m), 1970, NOAS coll.; ZMA 4.02.026, Prefil de Caviana, Pará State (56 m), 01/v/1968, NOAS coll.

Type locality

Off Amapá State, north coast of Brazil.

Additional material

--Amapá state: MORG 15886, off Cabo Orange (85 m), 1970, NOAS coll. [1]; MORG 14811, off Amapá State (56 m), 01/v/1968, NOAS coll. [6]; --Pará State: IBUFRJ 8871, AMASSEDS # 4134, x/1991, RVCI coll. [1]; IBUFRJ 9455, AMASSEDS # 3210 (01°52.45'N, 16.02'W, 47 m), 12/v/1990, RVCI coll. [3].

Figs 121-126. *Turbonilla rhachialis* n. sp. 121: holotype (MNRJ 8918). 122-126: paratype (ANSP 410352). Fig. 121: whole shell (length: 10.4 mm); fig. 122: last whorl; figs 123, 124: details of sculpture; figs 125, 126: protoconchs. Scale bars: figs 123, 125,126: 300 µm; fig. 122: 1.0 mm; fig. 124: 100 µm.
Figg. 121-126. *Turbonilla rhachialis* n. sp. 121: olotipo (MNRJ 8918). 122-126: paratipo (ANSP 410352). Fig. 121: conchiglia intera (lunghezza: 10,4 mm); fig. 122: ultimo giro; figg. 123, 124: dettaglio della scultura; figure 125, 126: protoconca. Scala di riferimento: figg. 123, 125, 126: 300 µm; fig. 122: 1,0 mm; fig. 124: 100 µm.

Distribution

North coast of Brazil (Amapá and Pará States).

Etymology

This species is named after the Brazilian Indian tribe Uacá that inhabits an area in Amapá State.

Remarks

Turbonilla uaca (figs 127-132) is one of the largest *Turbonilla* species of the Brazilian coast. The shell of this species is very characteristic in its acuminate apex (fig. 127) and in having a very developed umbilicus and inner lip in some specimens (fig. 129). Although a slight umbilical fissure and somewhat reflected inner lip may be present in some species, these characters are uncommon and never (at least in the South American fauna) as strong as seen in some specimens of *T. uaca*. The most similar species is *Turbonilla incisa* Bush, 1899 [paratype illustrated by Absalão & Pimenta (1999: fig. 18)], which has similar shell sculpture, though stronger in *T. uaca* (figs 128-130). They can be distinguished by the acuminate apex of *T. uaca*, in which there is a relatively greater increase in diameter from the fifth whorl on (fig. 127).

ACKNOWLEDGEMENTS

We would like to thank Dr. A. Tablado (MACN), Dr. L. Simone (MZSP), Dr. C. Miyaji (IOUSP), Dr. J. C. Barros (MMUFRPE), Dr. P. Bouchet (MNHN), Dr. M. G. Harasewych (USNM), Mr. P. Maestrati (MNHN), Mr. R. Moolenbeek (ZMA), Dr. E. Rios (MORG) and Dr. G. Rosenberg (ANSP), Mr. D. Forcelli for the loan of part of the material examined; Dr. P. Souza Junior (MZSP), Ms. L. Guimarães (MZSP), Mr. J. Britto (Universidade do Estado do Rio de Janeiro) and Ms. M. Lopes (Pontifícia Universidade Católica do Rio de Janeiro) for their help with part of the SEM photos; and the anonymous referees who contributed

with critics and suggestions. This study was partially supported by CNPq. ("Conselho Nacional de Desenvolvimento Científico e Tecnológico") and CAPES ("Conselho de Aperfeiçoamento de Ensino Superior"), from the Brazilian Government.

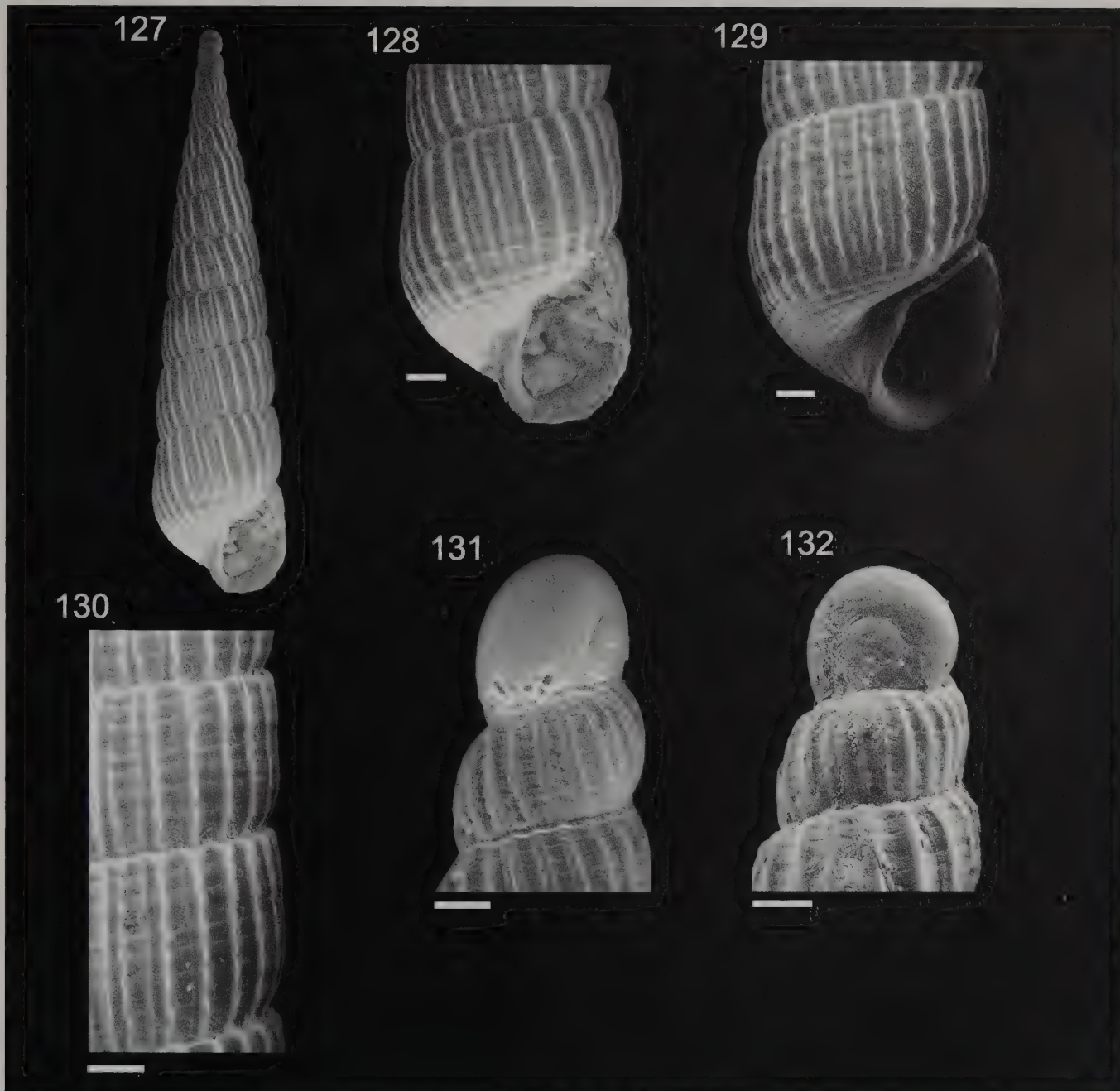
REFERENCES

AARTSEN J.J. VAN, 1981. European Pyramidellidae: II. *Turbonilla. Bollettino Malacologico*, Milano, 17 (5-6): 61-68

AARTSEN J.J. VAN, 1994. *Turbonilla coomansi*, a new name for *Turbonilla pusilla* (C. B. Adams, 1850) *non T. pusilla* (Philippi, 1844) (Gastropoda, Opistobranchia, Pyramidellidae). Basteria, Leiden, 58: 198.

ABBOTT R.T., 1974. *American Seashells* 2nd ed. Van Nostrand Reinhold Co., New York. 663 pp., 24 pls.

ABSALÃO R.S. & PIMENTA A.D. 1999. *Turbonilla* (Gastropoda: Pyramidellidae) species described by Katharine Jeannette Bush: scanning electron microscope studies of the type material in the Academy of Natural Sciences of Philadelphia. *Proceedings of the Academy of Natural Sciences of Philadelphia*, Philadelphia, 149: 77-91.

ABSALÃO R.S., PIMENTA A.D. & COSTA P.M.S. 1996. Novas ocorrências de gastrópodes marinhos no litoral do Rio de Janeiro (Brasil). *Nerítica*, Curitiba, 10

Figs 127-132. *Turbonilla uaca* n. sp. 127, 128: holotype (MORG 41047); 129-132: paratype (MNHN). Fig. 127: whole shell (length: 7.2 mm); figs 128, 129: last whorls; fig. 130: detail of sculpture; figs 131, 132: protoconchs. Scale bars: figs 128-130: 300 µm; figs 131, 132: 100 µm.

Figg. 127-132. *Turbonilla uaca* n. sp. 127, 128: olotipo (MORG 41047); 129-132: paratipo (MNHN). Fig. 127: conchiglia intera (lunghezza: 7,2 mm); figure 128, 129: ultimo giro; fig. 130: dettaglio della scultura; figg. 131, 132: protoconche. Scala di riferimento: figure 128-130: 300 µm; figg. 131, 132: 100 µm.

(1-2): 57-68.

BUSH K.J., 1899. Descriptions of new species of *Turbonilla* of the Western Atlantic fauna, with notes on those previously known. *Proceedings of the Academy of Natural Sciences of Philadelphia*, Philadelphia, 51, 145-177.

ADAMS C.B., 1850. Descriptions of suposed new species which inhabit Jamaica. *Contributions to Conchology*, New York, 5: 69-75.

CASTELLANOS Z.J.A., 1982. Los Pyramidellidae de la Republica Argentina. *Comunicaciones de Museu argentino de Ciencias Naturales Bernardino Rivadavia*, Buenos Aires, 7: 61-85.

DALL W.H. & SIMPSON C.T. 1901. The Mollusca of Porto Rico. *Bulletin of The United States Fish Commission*, Washington, 20: 351-524, pl. 53-58.

DALL W.H. 1927. Small shells from dredgings off the southeast coast of the United States by the United States Fisheries steamer "Albatross" in 1885 and 1886. *Proceedings of the United States National Museum Washington*, 70 (2667): 1-134.

DIAZ J.M.M. & PUYANA M.H., 1994. *Moluscos del Caribe Colombiano.* Colciencias y Fundación Natura, Santafé de Bogotá. 291 p., 37 pls.

D'ORBIGNY A., 1835-1846. *Voyage dans l'Amerique méridionale.* Mollusques: 1-48 (1835); 49-184 (1836); 185-376 (1837); 377-408 (1840); 409-488 (1841); 489-758 (1846). Paris.

D'ORBIGNY A., 1841-1842. Mollusques, in R. DE LA SAGRA: *Historie physique, politique et naturelle de l'Ile de Cuba*: 1-208 (1841); 209-264 (1842). Paris.

FARINATI E.A., 1993. Pyramidellidae (Mollusca, Gastropoda) en sedimentos Holocenos de Bahía Blanca, Argentina. *Ameghiniana*, Buenos Aires, 30 (3): 297-310.

HERMANNSEN A.N., 1852. *Indices genearum malacozoorum.* supplementa et corrigenda: 1-140. Cassel.

JEFFREYS J.G., 1884. On the Mollusca procured during the "Lightining" and "Porcupine" Expeditions, 1868-70. (Part VIII). *Proceedings of the Zoological Society of London* 1884, London, 341-365, pls. 26-28.

JOHNSON R.I., 1989. Molluscan taxa of Addison Emery Verrill and Katharine Jeannette Bush, including those introduced by Sanderson Smith and Alpheus Hyatt Verrill. *Occasional Papers on Mollusks*, Cambridge, 5 (67): 1-143.

JONG K.M. DE & COOMANS H.E., 1988. *Marine Gastropods from Curacao, Aruba and Bonaire.* E. J. Brill, Leiden, 261 p., 47 pls.

MÖRCH O.A.L. 1875. Synopsis Molluscorum marinorum Indiarum occidentalium. *Malacozoologishe Blätter für* 1874 und 1875 22.

ODÉ H., 1996. A list of turbonillid taxa for the Western Atlantic. *Texas Conchologist,* Houston, 32 (2-3): 33-75.

PEÑAS A. & ROLÁN E., 1997b. La familia Pyramidellidae Gray, 1840 (Mollusca, Gastropoda, Heterostropha) en África Occidental. 2. Los géneros *Turbonilla y Eulimella. Iberus*, Oviedo, Suppl. 3: 1-105.

PEÑAS A. & ROLÁN E., 2000. The family Pyramidellidae Gray, 1840 (Mollusca, Gastropoda) in West Africa. 7. Addenda to the genera *Eulimella* and *Turbonilla* with list of the East Atlantic species and synonyms. *Argonauta*, Roma, 13 (2): 59-80.

PEÑAS A., TEMPLADO J. & MARTÍNEZ J.L., 1996. Contribucíon al conocimiento de los Pyramidelloidea (Gastropoda: Heterostropha) del Mediterráneo español. *Iberus*, Oviedo, 14 (1): 1-82.

PILSBRY H.A. 1922. Revision of W. M. Gabb's Tertiary Mollusca of Santo Domingo. *Proceedings of The Academy of Natural Sciences of Philadelphia*, Philadelphia, 73 (2): 305-435, pls. 16-47.

PIMENTA A.D. & ABSALÃO R.S. 1998. New names for four species of the genus *Tubonilla* (Gastropoda, Heterobranchia, Pyramidellidae). *The Journal of Conchology*, London, 36 (2): 63.

PIMENTA A.D. & ABSALÃO R.S. 2001. Taxonomic revision of the species of *Turbonilla* Risso, 1826 (Gastropoda, Heterobranchia, Pyramidellidae) with type localities in Brazil, and description of a new species. *Basteria*, London, 65: 69-88.

PIMENTA A.D. & ABSALÃO R.S. 2002. On the taxonomy of *Turbonilla puncta* (C. B. Adams, 1850) (Gastropoda, Pyramidellidae), with the description of a new species from Brazil and remarks on other western Atlantic species. *Zootaxa*, Auckland City, 78: 1-16.

REDFERN C. 2001. *Bahamina Seashells – A Thousand Species from Abaco, Bahamas.* Bahamianseashells.com Inc., Boca Raton. ix + 280 pp., 124 pls.

RIOS E.C., 1994. *Seashells of Brazil.* 2nd ed. Museu Oceanográfico Prof. E. C. Rios da Fundação Universidade do Rio Grande, Rio Grande. 368 p., 113 pls.

RISSO A., 1826. *Histoire naturelle des principales productions de l'Europe meridionale et particulièement de celles des environs de Nice et des Alpes Maritimes*, Paris, 4: 439 p., 12 pls.

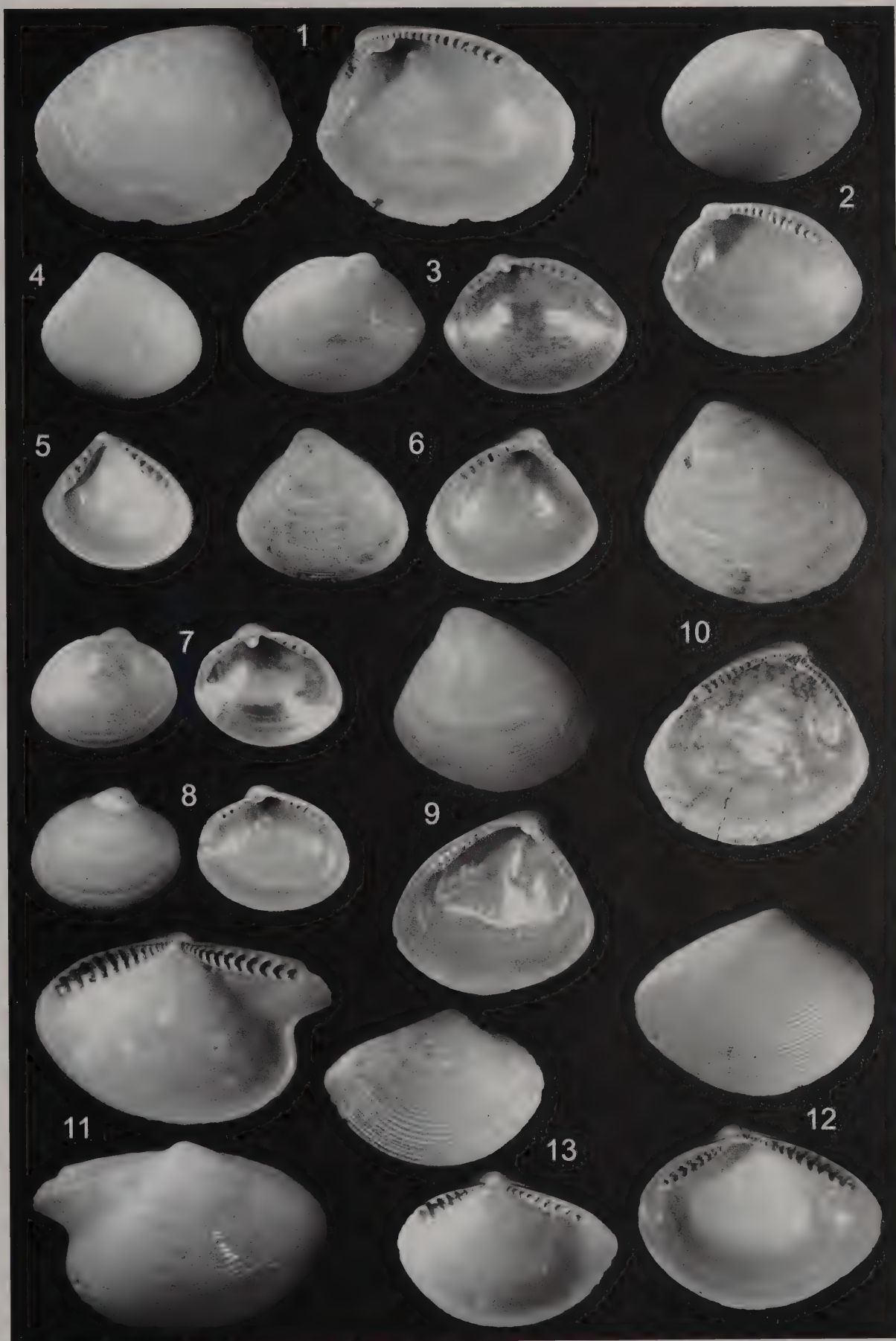
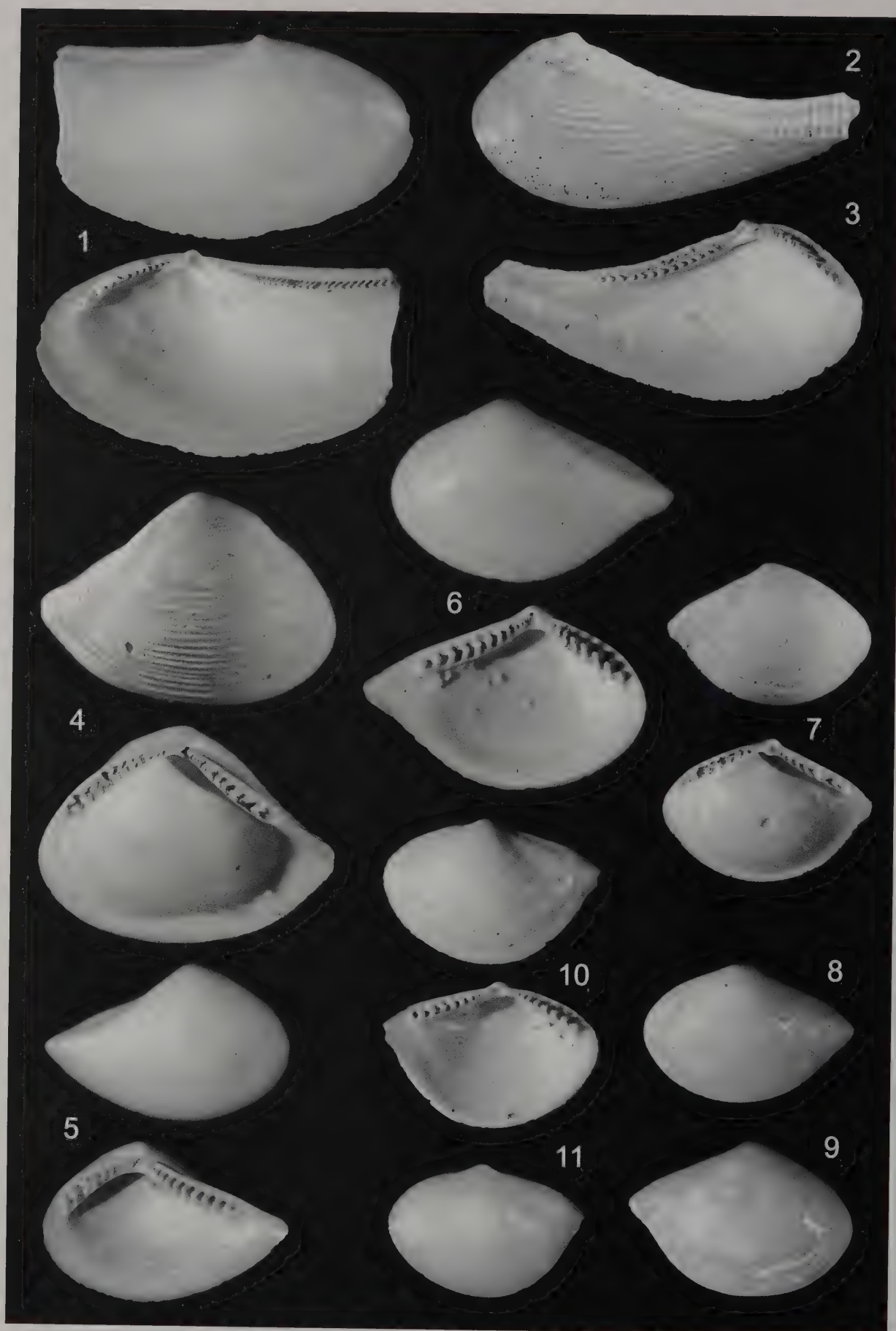
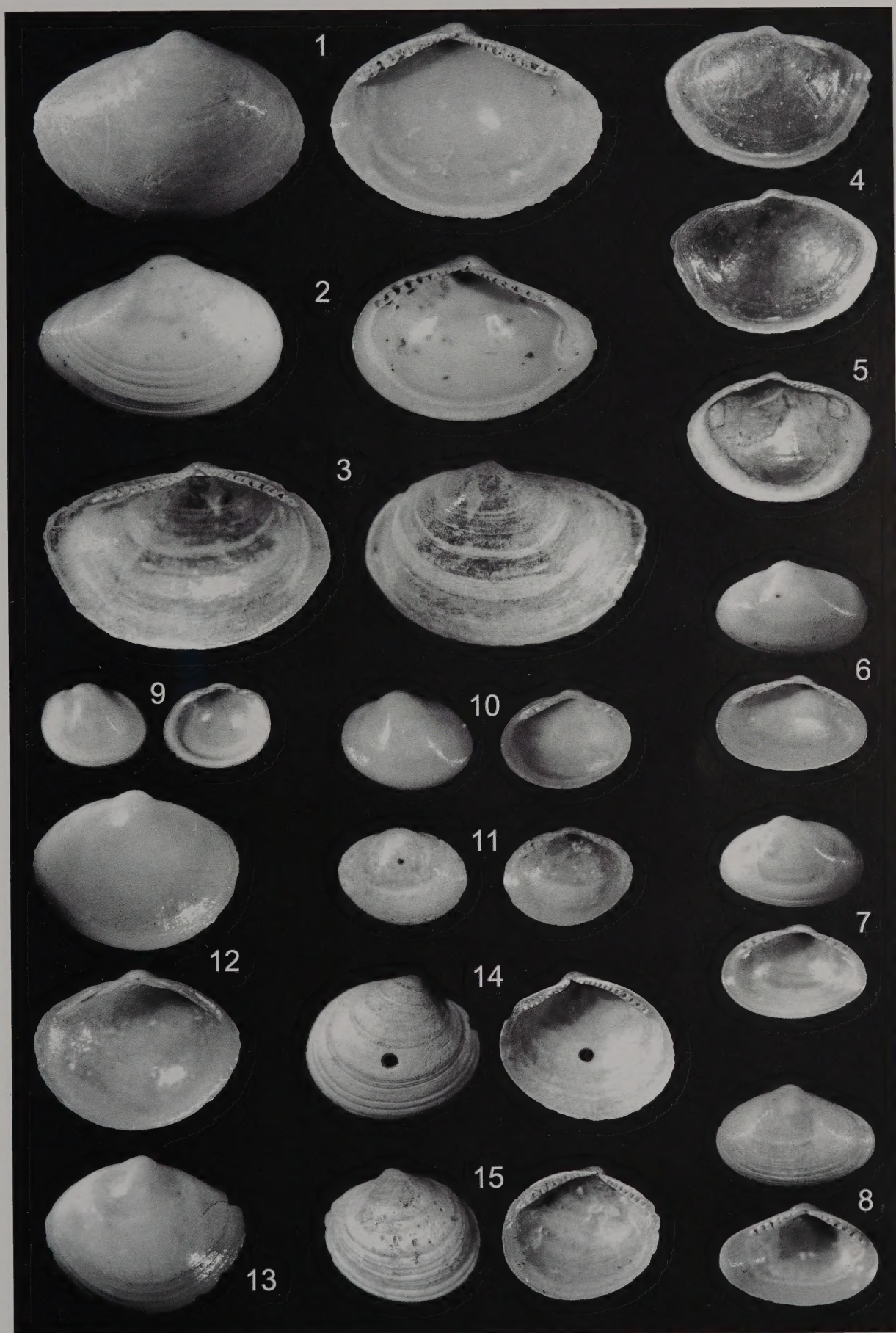
SCHANDER C., 1994. Twenty-eight new species of Pyramidellidae (Gastropoda, Heterobranchia) from west Africa. *Notiziario CISMA*, Roma, 15: 11-78.

VERRILL A.E. & BUSH K. J., 1900. Additions to the marine mollusca of the Bermuda. *Transactions of the Connecticut Academy of Sciences*, New Haven, 10: 513-544, pls. 63-65.

VOKES H.E. & VOKES E.H., 1983. Distribution of Shallow-Water Marine Mollusca, Yucatan Peninsula, Mexico. *Middle American Research Institute*, New Orleans, 54: 183 p., 50 pls.

WARMKE G. & ABBOTT R.T., 1962. *Caribbean Seashells.* Narbeth, Livingstone Publish, New York, 348 pp., 44 pls., 34 figs. 19 map.

WATSON R.B., 1886. Report on the Scaphopoda and Gastropoda collected by H. M. S. "Challenger" during the years 1873-1876. *Scientific Results of the Voyage of the H. M. S. Challenger, Zoology*, London, 15 (42): 756 pp., 50 pls.

Lavoro accettato il 22 Giugno 2002

FORMATO CONSIGLIATO ED ISTRUZIONI PER GLI AUTORI

I manoscritti dovranno essere presentati su fogli bianchi UNI-A4 di buona qualità, scritti con interlinea doppia, ed almeno 3 centimetri di margine ai lati. Tutte le pagine dovranno essere numerate consecutivamente. Tabelle, figure e didascalie dovranno essere stampate su fogli separati; la loro posizione approssimativa nel testo deve essere indicata a margine dello stesso, ma la composizione finale spetta alla Redazione.

I manoscritti dovranno essere organizzati come segue:

Prima pagina: contenente il titolo dell'articolo, il nome(i) per esteso dell'Autore(i), l'indirizzo cui inviare la corrispondenza (comprensivo di indirizzo di posta elettronica, se disponibile), le parole chiave (fino ad un massimo di dieci).

Seconda pagina: con l'Abstract (in inglese), Riassunto (in italiano), Resumen (in spagnolo) o Resumé (in francese) a seconda della lingua utilizzata dall'Autore(i) nell'articolo. Un riassunto esteso, più dettagliato e contenente ogni utile riferimento per guidare il lettore ad una rapida comprensione dell'articolo (ad es. i caratteri diagnostici di una specie), deve seguire il riassunto classico. In questa sezione ogni riferimento a figure, tavole o citazioni bibliografiche deve essere evitato. Il riassunto esteso deve essere scritto in inglese od in italiano.

Pagine di testo: il testo deve essere composto da frasi chiare e brevi, possibilmente suddiviso in Introduzione, Materiali e Metodi, Risultati, Discussione, Conclusioni, Ringraziamenti, Riferimenti Bibliografici, Tabelle, Figure e didascalie (in pagine separate). Evitare le note se possibile. Le note indispensabili saranno indicate con un numero progressivo tra parentesi nel testo e collocate in fondo alla pagina cui si riferiscono. Tutte le abbreviazioni dovranno essere spiegate in una legenda. Solo e tutti i nomi di genere e specie devono essere in corsivo (o sottolineati). Ogni nome scientifico dovrà essere accompagnato da Autore ed anno di pubblicazione, la prima volta che viene citato nell'articolo. Tutte le figure devono essere numerate progressivamente con numeri arabi e devono essere citate nel testo. Le figure devono essere presentate su fogli a parte, ognuno con il nome dell'Autore(i) e titolo dell'articolo. I disegni al tratto dovranno essere chiari, tracciati con linee sottili di inchiostro nero di China su carta bianca di alta qualità o carta lucida ed essere almeno delle dimensioni finali di stampa. Quando possibile le figure dovranno essere raggruppate in tavole; la Redazione si riserva il diritto di ridurre o ingrandire gli originali in fase di composizione dell'articolo. Le indicazioni sulle figure (numeri e/o lettere) dovranno essere in caratteri Times New Roman minuscoli (Es. Fig. 1a, 1b, etc.), tenendo conto che nella loro versione finale questi caratteri dovranno avere un'altezza di 2,5-3 mm. Le stampe fotografiche dovranno essere nitide, ben contrastate non montate su cartoncini ma stampate su carta lucida fotografica, di dimensioni non inferiori rispetto a quelle finali. Due o più fotografie montate in una tavola devono avere toni simili. Illustrazioni a colori sono accettate solo se rilevanti scientificamente per il lavoro. Riproduzioni di illustrazioni protette da copyright dovranno essere accompagnate da un'autorizzazione scritta del proprietario del copyright. Si raccomanda agli Autori di inviare dapprima una bozza delle figure (nella loro taglia originale) con il manoscritto. Nella loro versione finale, ad accettazione avvenuta del manoscritto, le figure dovranno essere inviate esclusivamente in formato TIFF (con una risoluzione minima di 300 dpi) su di un disco ad alta capacità Zip 100 o su di un CD-rom. Le citazioni nel testo dovranno seguire uno dei seguenti esempi: "...Monterosato (1869) riportò...", "...Monterosato (1869, 1884) riportò...", "...Verrill & Bush (1900) descrissero...", "De Folin (1867a, 1867b)", "come noto in letteratura (De Folin, 1867a, 1867b; Monterosato, 1869, 1884; Verrill & Bush, 1900)","...du Golfe de Gascogne (Fischer et al., 1872)". Tutte e solo le opere citate nel testo devono essere elencate in ordine alfabetico e cronologico al termine del lavoro.

Riferimenti bibliografici: utilizzare il MAIUSCOLETTO (non il MAIUSCOLO) solo nelle citazioni in Bibliografia, nello stile dei seguenti esempi.

Articoli:

COGNOME ed iniziale del nome di tutti gli autori, anno. Titolo completo. *Nome della rivista per esteso*, **Volume** (fascicolo): prima ed ultima pagina del lavoro.

Es.:

MONTEROSATO T.A., 1880. Conchiglie della zona degli abissi. *Bullettino della Società malacologica italiana*, 6 (1-4): 50-64.

Libri:

COGNOME ed iniziale del nome di tutti gli autori, anno. *Titolo completo*. Editore, Città di edizione, numero di pagine (e illustrazioni).

Es.:

WILEY E.O., 1980. *Phylogenetics: the theory and practice of phylogenetic Systematics.* Wiley, New York, 355 pp.

Capitoli di libri:

COGNOME ed iniziale del nome di tutti gli autori (del capitolo), anno. Titolo completo (del capitolo). In COGNOME ed iniziale dell'Editore(i) (Ed. or Eds), *Titolo del libro.* Città di edizione, Editore, pagine relative al capitolo (of the chapter).

Es.:

BEDULLI D., CASTAGNOLO L., GHISOTTI F. & SPADA G., 1995 Bivalvia, Scaphopoda. In MINELLI A., RUFFO S., & LA POSTA S. (Eds), *Check list delle specie della fauna italiana.* Bologna, Calderini, 17: 80-90.

I manoscritti non conformi alle norme qui esposte non saranno considerati per la pubblicazione. I lavori tassonomici dovranno rispettare sia gli Articoli che le Raccomandazioni del Codice Intenazionale di Nomenclatura Zoologica (ICZN, edizione corrente).

Il manoscritto finale dei lavori accettati dovrà essere accompagnato da una versione su CD per computer (MacIntosh o PC), elaborata con uno dei Word processor più comuni (e.g. MS-WORD®, WORDPERFECT®).

PROOF AND REPRINTS

Gli autori riceveranno una copia delle prime bozze; esse dovranno essere corrette a penna rossa in modo chiaro e rispedite al più presto. Sarà richiesto un contributo spese per aggiunte o per i cambiamenti introdotti dopo la composizione tipografica. La Società Italiana di Malacologia provvede 20 estratti gratuiti per ciascun articolo. Altri estratti potranno essere ordinati con la restituzione delle bozze.

RECOMMENDED FORMAT AND INSTRUCTIONS FOR AUTHORS

Manuscripts must be submitted on good quality, white UNI-A4 sheets, double spaced, with at least 3 cm margins. All pages must be numbered consecutively, with tables, figures and legends placed in separate pages; their approximate position in the text should be indicated in the margin but the final composition is decided by the Redaction. The articles should be organised as follows:

Title page: with title of the article, full name(s) of the Author(s), correspondence address (comprehensive of e-mail address, if available), and Key Words (up to ten).

Second page: with Abstract, Riassunto, Resumen or Resumé according to the language used by the Authors in the article. An Extended Abstract, more detailed and containing any useful reference to drive the reader to a quick comprehension of the article (e.g. the diagnostic characters of a species), must follow the Abstract. References to figures, tables and bibliographic citations however, are to be avoided. The extended abstract must be written in English or Italian.

Text Pages: the text should be presented in clear, short sentences and possibly arranged in Introduction, Material and Methods, Results, Discussion, Conclusions, Acknowledgements, References, Tables, Figures and Legends (in separate pages). Avoid footnotes if possible. If necessary, notes will be indicated by a number between parentheses in the text, and placed at the bottom of the relevant page. All abbreviations must be explained in a legend. Only and all the names of genus and species rank must be italicised (or underlined). Each scientific name will be accompained by its authorship and year of publication, the first time it is mentioned in the text. All figures must be numbered progressively with Arabic numerals, and must be cited in the text. Figures must be submitted in separate pages, each with the name of the Author(s) and the title of the paper. Line drawings should be clear and drawn with thin lines in black Indian ink on high-quality white paper, tracing paper, or plastic film, and be at least the final size. When possible the figures should be grouped in plates: the Redaction will operate the final enlargement/reduction in order to fit the iconography to the composed paper. Pictures in the plate must be labelled with Times New Roman lower case letters (Es. Fig. 1a, 1b, etc.). Labelling on the figures (letters and numbers) must be planned in order to have a final height of 2.5-3 mm. Photographs should be clear, with a sufficiently sharp contrast, printed on white paper with a glossy finish, no less than the final size, and should not be mounted on card. Two or more photographs combined in a plate should be similar in tone. Colour illustrations are accepted only if scientifically relevant to the paper. Reproduction of figures protected by copyright is allowed provided that a written permission by the holder of the copyright is furnished along with the manuscript. Authors are advised in the first instance to send drafts of figures (in original size) with the manuscript. In the final version of an acceped manuscript, figures must be sent exclusively in TIFF format (with a minimum resolution of 300 dpi) on a Zip 100 diskette or on a CD-rom. Citation in the text must follow one of the following examples: "...Monterosato (1869) reported...", "...Monterosato (1869, 1884) reported...", "...Verrill & Bush (1900) described...", "De Folin (1867a, 1867b)", "as known from literature (De Folin, 1867a, 1867b; Monterosato, 1869, 1884; Verrill & Bush, 1900)","...du Golfe de Gascogne (Fischer et al., 1872)". All and only the works cited in the text must be reported alphabetically and chronologically in the references.

References: use SMALL CAPS (not ALL CAPS) for citations in the References, according to the following examples:

Articles:

SURNAMES and initials of all authors, year. Full title. *Journal* (no abbreviations), **Volume** (number): first and last page numbers.

E.g.:

MONTEROSATO T.A., 1880. Conchiglie della zona degli abissi. *Bullettino della Società malacologica italiana*, 6 (1-4): 50-64.

Books:

SURNAMES and initials of all authors, year. *Complete Title.* Publisher, place of issue, number of pages and plates.

E.g.:

WILEY E.O., 1980. *Phylogenetics: the theory and practice of phylogenetic Systematics.* Wiley, New York, 355 pp.

Chapters in books:

SURNAMES and initials of all authors (of the chapter), year. Complete title (of the chapter). In Names and initials of the Editor(s) (Ed. or Eds), *Title of the book.* Place of issue, Publisher, number of pages (of the chapter).

E.g.:

BEDULLI D., CASTAGNOLO L., GHISOTTI F. & SPADA G., 1995 Bivalvia, Scaphopoda. In MINELLI A., RUFFO S., & LA POSTA S. (Eds), *Check list delle specie della fauna italiana.* Bologna, Calderini, 17: 80-90.

The manuscripts that do not conform to the present guidelines will not be considered for publication. Taxonomic papers must respect both Articles and Recommendation of the International Code of Zoological Nomenclature (ICZN, current edition).

The final version of the accepted papers must be sent as manuscript and on computer diskette (3,5" MacIntosh o PC), prepared by one of the more commonly used word-processor (e.g. MS-WORD®, WORDPERFECT®).

PROOF AND REPRINTS

Authors will receive one set of proofs: they must be clearly corrected only for misprints with red ink and returned with the minimum delay. Extensive changes to the paper at this stage will be charged to the Authors. Twenty reprints are supplied free of charge; additional reprints may be ordered when returning the proofs.

SOMMARIO

Direttore Responsabile: Paolo Crovato

Coordinamento produzione: EVOLVER srl ROMA
Pre-stampa: EVOLVER srl ROMA
Stampa: BRITANNIA srl ROMA

Finito di stampare nel febbraio 2004

ISSN 0394-7149